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A

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A REFRACTION OPHTHALMOSCOPE.

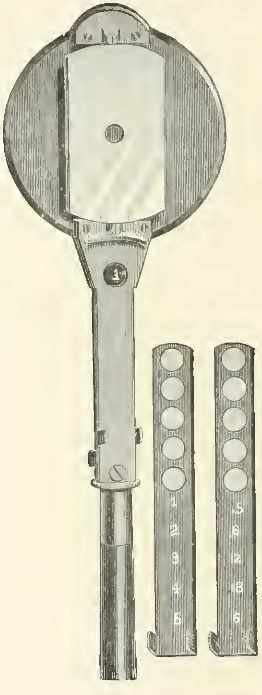
By Edward Jackson, M.D., of Philadelphia.

The Rekoss-disc for carrying the correcting lenses of the refraction ophthalmoscope, though generally used, is not without disadvantages. Where, as in most instruments, the sight-hole is at the upper border of the lens-disc, the mirror cannot be inclined to the right or left, for the examination of the erect image, unless it be placed some distance in front of the disc. To reduce this distance, some, as Parent and Juler, have added a special small mirror for the direct examination; others, like Loring, have narrowed the ordinary mirror, by removing a segment from either side.

Couper avoided the need of such expedients by placing the sight-hole at either side of the lens-disc, instead of on its upper margin. But he thus added to the second disadvantage of the disc—its breadth; which, with the necessity of turning it with the finger, brings the surgeon's hand in unpleasant proximity to the patient's face. This difficulty has been met in various instruments by using very small lenses, or by adding a second or even a third lens-disc, either superimposed or mutually replaceable; while to turn these discs, they have been geared to wheels placed below them, on the stem of the instrument, as by Noyes, Juler, and others.

These modifications have made the ophthalmoscope more complex, and have increased the third disadvantage of the disc—its weight. For we have to consider not only the weight of the metal in the disc or discs, but also the weight of the covers that keep the lenses from being soiled, and of the driving wheels where these are added. And since these are all at the upper part of the instrument, an extra heavy handle is often furnished to "balance" it.

To avoid the disadvantages of the disc, I have proposed placing the lenses in two slides, moving vertically, immediately back of the mirror (Trans. Am. Ophthal. Soc. for 1885, and "Med. News," Nov. 7, 1885). The improved instrument now made on this



plan is shown in the accompanying figure. The slides do not in the least interfere with the inclination of the

mirror, whatever its width. They are moved by pressure of the tip of the forefinger on one of the milled projections at their lower extremities, and a spring catch, acting on each, secures the centring of the lens at the sight-hole. The mirror shown in the figure is a segment of a circle, wider than that used by Dr. Loring, and a thin disc of metal is provided to shut extraneous light from the observer's eye. When a circular mirror is used, no such disc is needed.

It will appear that by this plan the size and number of the correcting lenses are limited. By neat workmanship five lenses of a diameter of five millimetres are placed in each slide, and a sixth may be added by allowing the slide to project some millimetres above the mirror when the strongest lens is in use. A lens five millimetres in diameter, when placed so near the mirror, is quite large enough.

Let us see what lens series can be obtained by the combinations of two slides containing five lenses each. Those shown in the figure are :—

First slide, 1, 2, 3, 4, and 5 dioptries convex.

Second slide, 0·50, 6, 12, and 18 D. concave, and 6 D. convex.

Giving: Convex, 0·50, 1, 1·50, 2, 2·50, 3, 3·50, 4, 4·50, 5, 6, 7, 8, 9, 10, and 11 D.

Concave, 0·50, 1, 2, 3, 4, 5 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 D.

Another series is the following :—

First slide, 1, 2, 3, 4 D. convex, and 22 D. concave.

Second slide, 0·50, 5, and 10 D. concave, and 5 and 10 D. convex.

Giving: Convex, 0·50, 1, 1·50, 2, 2·50, 3, 3·50, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, and 14 D.

Concave, 0·50, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 17, 22, 27, and 32 D.

These series might be indefinitely multiplied ; others are given in the Transactions of the American Ophthalmological Society for 1886 ; but the following is, in my opinion, the simplest, and of the greatest practical value :—

First slide, 1, 2, 3, 4, and 10 D. convex.

Second slide, 0·50, 2·50, 5, 10, and 25 D. concave.

Giving : Convex, 0·50, 1, 1·50, 2, 2·50, 3, 3·50, 4, 5, 7·50, and 10 D.

Concave, 0·50, 1, 1·50, 2, 2·50, 3, 4, 5, 6, 7, 8, 9, 10, 15, and 25 D.

This series may seem deficient as to the stronger lenses. But it should be remembered that the convex 5 D. lens, withdrawn two and a quarter inches from the eye, corrects 7 D. of hyperopia ; while the concave 25 D. lens, one inch from the eye, corrects but 15 D. of myopia. Theoretically, the correcting lens of the ophthalmoscope should be placed the same distance from the patient's eye as the spectacle glass ; but in practice the distance varies, being sometimes double that assumed by the theory. Hence anything like an accurate estimate of the higher degrees of ametropia requires the measurement of this distance, and the slight varying of it is the simplest way of making an accurate estimate ; while for the approximate estimation of any degree of ametropia, or a clear view of the fundus, this lens series is ample.

The ability to get every combination of lenses without taking the instrument from the eye, and to go from zero to any desired lens without running through all the intermediate lenses, with other advantages only to be appreciated by one who uses it, make this, in my judgment, the most convenient and serviceable, as well as the lightest and simplest, refraction ophthalmoscope yet proposed.

As made by James W. Queen and Company, of Philadelphia, its weight, with handle, is thirty grammes.

FIBROMA OF CORNEA.*

By Arthur H. Benson, M.A., F.R.C.S.I.,
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The tumour was removed from the apex of the cornea of a girl, M. B., aged 19, otherwise in good health. *History*: She stated that three years ago she, for the first time, observed a white speck in front of the pupil of the eye. It was then about the size of a small pin's head, and its appearance had not been preceded by any pain, vascularity, or other sign of inflammation. The spot slowly grew, both in density and extent of surface, and gradually obscured vision more and more till September 24th, 1886, when I first saw her at St. Mark's Hospital.

The appearance of the eye then somewhat suggested that of one in which there had been a deep ulcer which had healed up, leaving a dense leucoma in the centre of the cornea.

On further examination, however, the opacity in the cornea was found to be raised above the surface of the surrounding cornea to the extent of nearly a millimetre, whilst the normal corneal tissue under the tumour remained transparent. The tumour was perfectly circular, 4 mm. in diameter, with well-defined edges, and the corneal epithelium extended over it without interruption. There was no evidence of past inflammation of any sort in the neighbouring part of the cornea, nor any trace of bloodvessel, past or present, going to the tumour.

Both the history and the appearance, therefore, preclude the idea of its being a leucoma.

For a short time before I saw her, though there was no sign of vascularity or inflammation anywhere to be seen, she had had some discomfort in that eye, probably

* Read before Pathological Section of Academy of Medicine in Ireland, and sections exhibited, November 5th, 1886.

due to the protrusion of the growth above the corneal surface; but it was on account of the remarkable appearance of her eye that she sought relief.

Tested with her back to the light she could see nearly as well with one eye as with the other, each being myopic $V = \frac{6}{18}$. Facing the light the vision of the left was almost wholly obscured, but with atropine she could see well enough.

As the growth was extending, and had already so far interfered with vision, I advised removal by excision.

With a few turns of Bowman's corneal trephine, which just fitted it, I isolated its margins from the surrounding cornea, and with a curved, broad, corneal needle, and a pair of forceps, I dissected the tumour off from the cornea, to which it was so intimately attached that it required very definite dissection to separate it. The tumour was densely white and opaque, whilst the cornea, at nearly the normal level, was perfectly clear below it. The ulcer which was left in the centre of the cornea after the removal of the tumour healed quickly, and the patient left hospital with only a very slight nebula, in place of the dense white patch.

Histologically the tumour is a fibroma, and resembles corneal tissue, with its fibres, corpuscles, &c. The sections were unfortunately made parallel instead of at right angles to its surface, and the remains of the tumour being so small were not preserved. I regret this very much, as a vertical section might have thrown some further light upon its origin and nature.

Tumours of this kind are, I believe, rare; I have never before seen anything like it, nor can I find mention of such in any of the works which I have been able to consult.

Alt, in his "Histologie des Auges," p. 40, says:—"Although in the literature of the subject a large number of tumours are described as corneal tumours, I know of none such, and doubt the correctness of the term, so much the more since *hardly any of them*

engaged the corneal tissue alone. The usual so-called tumours arise from episcleral tissue, and shall be fully considered in that connection." The case I have just described seems, however, most certainly to be one of corneal tumour, originating in the cornea, and engaging corneal tissue alone.

STILLING (Strassburg). **On the Causation of Myopia.** *Bericht über die Achtzehnte Versamml. der Ophthalmolog. Gesellsch. Heidelberg*, 1886, *p.* 14.

KNIES (Freiburg). **On the Nature and Treatment of Myopia.** *The same, p.* 26.

FOERSTER (Breslau). **On the Influence of Concave Glasses and Convergence of the Ocular Axes in the Increase of Myopia.** *Archives of Ophthalmology, Dec.*, 1886, *p.* 399.

These papers raise several important questions concerning the causes and treatment of myopia, and they show how widely good observers are still at variance with regard to this subject. Our knowledge of myopia has certainly been added to of late in several directions, *e.g.*, in the statistics of the affection, in the dynamics of the ocular muscles, in the co-ordination of accommodation with convergence, and so forth, but here, as elsewhere in the realm of pathology, there is some danger that the study of minor points may detract from the comprehensiveness of our views; the broad and rational exposition so well laid down by Donders seems in danger at times of being replaced by narrower conceptions.

Stilling admits that the close use of the eyes on near objects is concerned in producing myopia, but urges that neither the act of accommodation, nor the act of convergence, has been shown by any sufficient evidence to be the efficient cause. He has made, by means of dissections in the human subject, some observations as to the action of the ocular muscles, and their influence upon the form of the globe, which appear to throw fresh light on the subject. He attaches special importance to the superior oblique, the position and action of which he finds to be very variable.

When the roof of the orbit is removed, and the carefully-exposed muscles are gently pulled, in imitation of their natural contractions, by means of forceps, their effect upon the shape of the globe can be studied. Thus the recti are seen to draw the eye slightly backwards against the retrobulbar fat, and thereby to slightly flatten it in its antero-posterior axis; the superior oblique, on the other hand, draws the eye more or less forward, and, in certain cases, distinctly compresses it from above downwards. The course and insertion of the superior oblique vary greatly; there are two extreme types; in the first the tendon is attached in a curved line, and does not bear upon the globe; in the second it lies in contact with the globe, so that when the muscle contracts, the pressure produces a deep furrow. Furthermore, the tendon may extend backwards obliquely or even longitudinally towards, and nearly as far as, the optic nerve; in these cases contraction of the muscle produces a well-marked dragging and stretching (zerrung) at the margin of the nerve. Among fifty eyes examined with regard to these points, in some both the stretching and compression were visible; in others, the stretching only; in others, the compression only, and again, in others, neither the one nor the other. These differences were clearly due to variations in the attachment of the superior oblique.

Stilling controlled his first results by examining, in conjunction with an anatomist-colleague, a second series of fifty eyes, noting in addition to the other points, the form of the papilla. The form of the globe was found to be dependent upon the position of the superior oblique. It is erroneous to suppose that the normal eye is regularly spherical; so far back as the hind limit of the ciliary body it is usually of regular shape; behind that, protrusions or humps are common. Thus, in about six cases in which the tendon of the oblique ran almost directly backwards, there were large humps on each side of it, and the general shape of the globe was peculiar in that its antero-posterior axis measured 20 mm., its transverse axis from 24 to 26 mm.

Not only the general shape of the globe, but peculiarities in the shape of the papilla and the various forms of the atropic crescent at the margin of the papilla were found to be related to the pull of the superior oblique on the nerve margin. This

pull usually took effect over a crescentic area, exactly in the region in which the atropic crescent of myopic eyes is usually found ; in a few cases it acted chiefly on the upper margin of the nerve, and by this exceptional action the author explains the occasional presence of a crescent in this position.

A certain number of myopic eyes, how many is not stated, were examined in the same way, and gave support to the theory that the changes proper to the ordinary forms of myopia are produced by the action of the superior oblique during near vision.

Stilling's conclusions are to the effect:—1st. That the ordinary forms of myopia are non-pathological, and represent variations in the form of the globe due to the pressure and traction of the superior oblique during the period of growth, and that the non-increase of such myopia during adult life depends on the period of growth being over. 2nd. That the grade of the myopia in these cases depends largely upon the original curvature of the cornea (the evidence given in favour of this position is extremely scanty). 3rd. That high degrees of myopia are of essentially different nature from the foregoing ; that these eyes are diseased ; that they are not diseased because they are myopic, but, myopic because they are diseased, the morbid process being essentially a hydrophthalmia, which leads on to morbid stretching of the eye, irido-choroiditis and phthisis, distension of the anterior chamber, enlargement of the intra-vaginal space around the nerve entrance, and so forth ; these eyes, he says, are diseased, and hence become myopic.

According to Stilling, then, myopia of progressive type and disastrous issue is originally and essentially of different nature from the milder forms ; it is not an aggravation of the latter. From this view we dissent entirely. It is true of course that a hydrophthalmia, or in other words a secondary glaucoma, will distend the eye-ball, especially the youthful eye-ball, so as to produce myopia of very high degree, apart altogether from any excessive use of the eyes on near objects ; but there is no evidence of the glaucomatous process in ordinary progressive myopia. Where are we to draw the boundary line between Stilling's two groups—the healthy eyes and the diseased eyes ? Is it not true that a myopia which is at one time progressive, with choroidal congestion, an increasing crescent, and sensa-

tions of heat and pain, all ominous of serious mischief in the future, may, under careful regulations as to amount of work to be done, the manner of doing it, and the use of glasses, become absolutely stationary for long periods of time? and what is the essential difference, unless it be one of degree, between this myopia and the one which in the absence of such regulations goes on steadily from bad to worse, until after a period of years, with increasing disturbance in the choroid, and perhaps with detachment of the retina, it becomes entitled to a place in Stilling's second group? It is doubtless convenient to distinguish a *malignant* type of myopia from less serious types, but it is most important, we think, to remember that these types are actually separated by no hard and fast line, and to regard every considerable myopia as capable, more or less according to the actual state and use of the eyes, of passing on to a more serious condition.

Knies maintains the view that myopia, by which he means not the mere excess of refraction which is often present in healthy eyes, but the progressive pathological process, is due not to accommodative effort, not to convergence, and not to the supposed shortness of the optic nerve, but to choroidal hyperæmia and inflammation caused by overwork of the eyes. He does not explain how, apart from these agencies, an excessive use of the eyes on near objects affects the choroid. He points out that the natural growth of the eye from infancy to the adult state usually involves an increase of refraction, and that many eyes which are absolutely healthy as regards all their tissues overstep the emmetropic point. To the two refractive types which lie one on each side of emmetropia he would apply the terms *negative refraction* (hypermetropia), and *positive refraction* (myopia); he would limit the term *myopia* to a *morbid* elongation of the globe. Granting the importance of such a distinction when it can be made, we do not think it likely that this proposal to rob the word myopia of its present precise meaning will find much favour.

The morbid process, which Knies calls "the myopic process," may occur in eyes of each refractive type; thus, among 779 eyes suffering in this way, he found 88 cases of hypermetropia. The subjective symptoms, apart from the ultimate damage to distant vision, consist of congestive and pressure changes in the eye.

The dilatation of the pupil, which is not infrequent in young myopes, is noted by Knies as a sign of increased secretion into the eye, but this idea in our experience obtains no support from the tonometer or from the ordinary finger test of tension ; large pupils are common, apart from myopia, in overgrown children, in chlorotic girls, in short, in young people who from any cause are bloodless or neurasthenic, and the cause in such cases is certainly not an increase of the intraocular pressure.

The first subjective symptom of the myopic process is, according to Knies, a loss of the lustre (glanz) of the retina, together with more or less neuritis ; the papilla is reddened, its vessels hyperæmic, its substance, and often the surrounding retina also, more or less hazy. The neuritis varies much in degree, but is often very visible when the other eye is unaffected and serves for comparison ; it is usually best marked in the youngest patients. Later, the well-known crescent appears. Besides these changes there is often a thinning of the pigment layer as in glaucoma and some other disorders.

The author has not been able to substantiate his position by microscopical examination of the tissues of myopic eyes, but on the clinical evidence above given he maintains that the myopic process is essentially a diffuse choroiditis at the fundus oculi. Overwork of the eyes at and before puberty is the chief cause of the disease. The insufficient results of the so-called atropine cure, and the difficulty of carrying it out, led him to the idea of combating the process by means of eserine, the hypothesis being not that the tension would be reduced thereby, but that by contracting the pupil the excess of blood in the choroidal vessels might be brought from the back of the eye where it does harm, to the front where it would be harmless. A weak solution of eserine or pilocarpine is to be applied at bed-time for a period of four to eight weeks, and at the same time the severer kinds of eye-work are to be laid aside. He believes that he has by this means arrested the progress of myopia in some cases ; in some it still increased ; the majority of the cases were not seen again. He confesses himself unable to speak definitely as to the results obtainable by this treatment.

Foerster like almost all other authorities holds that insufficient light, ill-constructed desks, bad type, &c., are the remote causes of myopia, and that their evil influence depends

upon the bad positions of the body which they induce, but he urges that between such bad positions and the morbid lengthening of the eye-ball there is a gap which our knowledge has not yet completely bridged.

By the terms *tensor hypothesis* and *convergence hypothesis* he designates the views of those who refer the morbid process respectively to the action of the ciliary muscle (tensor of the choroid) and the action of the internal recti. He is absolutely opposed to the tensor hypothesis: if the elongation of the myopic eye were caused by the action of the tensor, myopia would carry with it its own remedy, because the work required of the tensor diminishes as myopia increases. The main object of his paper is to show, by clinical evidence, that a greater use of the accommodation than is usually considered safe for myopes, viz. the use of fully correcting glasses for near work, is often beneficial rather than the reverse. He is a strong believer in the *convergence* hypothesis. An objection which has been often urged to this latter is that cases in which convergence of maximum degree is habitually present, viz., cases of hypermetropic strabismus, show a minimum tendency to the development of myopia. Foerster points out the fact, well established, though often overlooked, that in the squinting hypermetropic eye the antagonism of the co-ordinated groups of muscles, and therefore the pressure on the globe, are less severe than in many cases of normal binocular fixation.

Foerster urges that two things are necessary in order to hinder the increase of myopia:—1. Persistent maintenance of a greater reading or working distance by means of mechanical apparatus. He would make this distance 16 inches, and of the various props and supports which have been invented for the purpose of insuring it he prefers Kallmann's (see also Cohn, O.R.,V., p. 330); 2. The constant employment of fully correcting concave glasses. Glasses which are strong enough only to *permit* of reading at the desired distance are, he thinks, insufficient; it is useful rather than harmful to give glasses which fully correct the myopia, because if the myope attempt as heretofore to hold his book unduly near, these induce an unpleasant accommodative strain which compels him to hold it further off.

To this somewhat extreme line of practice Foerster was led by observing that many persons who had persistently worn over-correcting glasses for years found no need to procure stronger glasses from time to time, as do many myopes, but that after periods of 10, 20, or even 30 years obtained full correction, or even over-correction, from the same glasses. Herein he finds an overwhelming argument against the tensor hypothesis, and an indication for the full correction of myopia as a means of checking its increase. Among a long series of cases of the kind in question he found no broad crescents; the crescents were mostly quite narrow, and often entirely absent. He gives cases to show with what impunity correcting and over-correcting glasses may be worn. Among them is the case of a man who at the age of 23 complained that he could no longer read with the glasses (concave 12 inch), which he had worn constantly for six years. Both eyes had E with perfect V. In many other cases also it was evident that an excessive accommodative strain had done no harm to the refraction.

The fact thus proved is most important. but is not the author trying to deduce too much from it. We see myopes who in spite of fully correcting glasses chosen by themselves, and in spite of further applications to the optician for stronger ones, have at last to seek skilled advice by reason of the persistent increase of their myopia. If a myopic eye armed with a fully correcting glass is safe from an increase of its myopia, why is the emmetropic eye not safe from the development of a myopia? Instead of saying that a full correction actually prevents further increase, would it not be more true to say that there are many myopic eyes in which a full correction may be given without danger? And are not the cases suited for such treatment just those in which the myopia has little progressive tendency, the tunics being sound, with little disposition to develop a crescent, the accommodation vigorous, and irritative symptoms absent? But whether this be so or not it seems highly probable that Foerster is right in desiring a larger correction of myopia in reading than is at present sometimes given. A greater reading distance is beyond question the essential point.

It should be added that Foerster allows the impropriety of a full correction for reading in some myopias of high degree, one reason, of course, being that the correcting glass so greatly

reduces the size of the image as itself to forbid of reading at a proper distance. He urges that partially correcting glasses should be combined, for reading, with abducting prisms. To show the effect of prisms upon the amount of convergence required for various "reading distances," he gives the subjoined table. In the first four columns are shown in centimetres a series of reading distances; if the book be held at any one of these distances, and the eyes be armed with a pair of prisms of the strength expressed at the top of the column, then the axis of the eyes will actually converge to a point situated at the distance shown in the fifth column. He points out that if the reading distance be very short,—*e.g.*, 17 cm.—prisms of 3° remove the actual point of convergence only to 20 cm., whereas with a greater reading distance, the same prisms will effect a much greater retrocession of the point of convergence. In making this comparison between the effects of the same prisms at different distances, it will, of course, be borne in mind that such effects are correctly measured by the *angular* movement of the eyes, not by the distance of the point to which they converge; a retrocession of 1 in. when the book is close to the face reduces the angle of convergence as much as does a retrocession of several inches when the book is further away.

Prisms	3°	4°	6°	8°	Distance of point of convergence.
Reading distances	17 cm.	16 cm.	15 cm.	14 cm.	20
	24	22	20	18	30
	30	27·5	24	21	40
	35	32	27	23	50
	37	33·5	28	24·6	55
		35	29·5	25·5	60
		38·5	31·5	27	70
			33·5	28·3	80
			35	29·3	90
			36	30·5	100

J. L. MINOR (Memphis). The Present Standing of Tobacco Amblyopia. *American Journal of Ophthalmology, February*, 1886.

A. ALT (St. Louis). One Hundred and Twenty Cases of Anæmic and Atrophic Conditions of the Optic Nerve and Retina. *American Journal of Ophthalmology, August and September*, 1886.

Minor gives a brief resumé, with running comment, of the writings of the more prominent adherents to the view, that there is a form of amaurosis due in part, or entirely, to the excessive use of tobacco. He argues that no such affection as tobacco amaurosis, as distinct from retro-ocular neuritis, is proven to exist ; while retro-ocular neuritis is often observed in those who do not use tobacco in any form. Retro-ocular neuritis is an organic disease ; and while tobacco is admitted to cause *functional disturbance*, it is not recognised as capable of producing *organic change in any tissue of the body;* whereas chronic alcoholism is often a cause of organic change in both the brain and optic nerves. Many believers in tobacco amaurosis recognise a very similar affection as due to alcohol. Therefore the possible influence of alcohol should be excluded before the diagnosis of tobacco amaurosis is made. Viewed thus, Minor thinks the reported cases do not prove the existence of tobacco amaurosis.

He then reports ten cases of amblyopia, in which, under treatment, cure, or very marked improvement, occurred in all but one (a case of central origin), although the patients continued to use tobacco to their accustomed excess. Potassium iodide was found the most useful remedy. It was used when the optic discs were unduly red. Strychnia, given when the discs were pale, was beneficial in some cases. In eight of these cases there was impairment of visual acuity and colour perception in the region of the macula, the peripheral portions of the retina remaining normal. The other two cases, in which there was disease of the central nervous system, presented concentric contraction of the fields of vision.

Dr. Minor's paper prompted Dr. Alt to collect all the cases of anæmic and atrophic conditions of the optic nerve that he had seen in the preceding five years, of which sufficient notes

had been kept to make them of any value. These he has reported in tabular form. They include all sorts of conditions, from microphthalmus to senile atrophy; and many of them were seen but once. Among the more frequent causes, nine cases are credited to syphilis and nineteen to lesions of the central nervous system. But the most frequently assigned cause was the toxic influence of alcohol or tobacco, or both in conjunction. Thus the cause was set down as alcohol and tobacco in thirty-four cases; tobacco alone, seven cases; alcohol alone, three cases; alcohol or tobacco with other depressing influences in seven cases. Central colour scotoma was present in twenty-one of the thirty-four cases due to tobacco and alcohol; in five of the seven due to tobacco alone; and in one of the three due to alcohol alone.

Alt *always* insists on total abstinence from tobacco during the treatment of these cases, and has seen a number of cases in which improvement only began after this rule was actually conformed to. Among drugs he relies mainly on strychnia, a dose of which subcutaneously has sometimes caused an improvement of two or three hundred per cent. in the central acuity of vision within five minutes. If the subcutaneous injection of one-twelfth or one-fifteenth of a grain of the nitrate of strychnia caused no improvement in vision he would give a very doubtful prognosis. He increases the dose until it causes headache, dizziness, or other unpleasant symptoms; sometimes giving as much as one-fourth or one-third of a grain hypodermically.

E. Jackson.

Carl Koller (Vienna). On a Peculiar Kind of Dioptric Images. (A contribution to the theory of Cylindrical Lenses.) *Graefe's Archiv.*, *XXXII.*, 3.

Those who have read Dr. Koller's original paper on cocaine must acknowledge that the association of his name with its introduction into daily ophthalmic practice is merited not only on account of what was certainly in itself a lucky discovery, but also by the thoroughly scientific manner in which the whole subject of its anæsthetic action on the eye was investigated by him.

The discovery, which is described and properly explained in the paper bearing the above title, though probably of no great practical importance, bears not a little resemblance in one respect to the discovery of the value of cocaine. For just as it is a matter of astonishment that the most valuable therapeutic action of that drug should have remained so long undiscovered, so it seems even more extraordinary that the peculiarity of the images which are formed by a particular combination of a cylindrical lens and the eye should so long have escaped the observation of the many who are constantly making use of cylindrical lenses for the purpose of correcting errors of refraction. Anyone who is in possession of a trial case of lenses will be able to study the following phenomena as they are described by Koller :—

1.—On looking at a vertical line some yards off through a convex cylindrical lens of 6·0 D, held with its axis vertical at arm's length from the eye, it will be observed that when the lens is slowly rotated round its optic axis the line also appears to rotate in the same direction and with double the rapidity. When the axis of the cylinder is at an angle of 45° with the vertical the line appears to be horizontal, and when the cylinder axis is horizontal the line is again seen vertical. It will be noticed, too, that of the two positions of the lens in which the line appears in its proper direction one gives a perfectly clear and the other a somewhat indistinct image of the line.

2.—When the line is nearer to the lens than its focus (say 10 cm. from it), a rotation of the lens does not produce a similar rotation of the line but a pendulum movement of it, a complete rotation of the lens causing two full pendulum movements of the image of the line.

3.—With a concave cylinder a similar pendulum movement but in the opposite direction is produced on the images of objects at all distances.

4.—If instead of a line an unsymmetrical object of any kind at a distance be looked at through the convex cylindrical lens (as in 1.) it is found that when the axis of the cylinder is vertical the image of the object appears to be upright, but as if seen in a

mirror—that is to say, what is to the right in the object appears to the left in the image, and *vice versa*. When the lens is rotated round its optic axis the image rotates with double the rapidity, so that when the cylinder axis is inclined at an angle of 45° to the vertical the image is horizontal, while when that axis is horizontal the image is inverted, but right and left are the same as in the object. *In every position, then, the image is similar to a reflected image, and corresponds to that which would be got by a mirror in a plane coinciding with that of the principal axial section of the cylindrical lens.*

The cause of these appearances is explained as follows:— All the rays proceeding from any point must, after passing through the combined system of cylindrical lens and eye, pass through two focal lines at right angles to each other. The distance from the first focal line to the second principal plane of the eye and that from the object to the first principal plane are conjugate distances; so also are the distances from these planes respectively of the second focal line, and the image given by the cylindrical lens alone. An erect image is therefore formed on the retina of every line at right angles to the direction of the cylinder axis, and an inverted image of every line parallel with that axis. The directional position of the image of an object depends therefore on that of the axis of the cylinder. During one complete rotation of the cylinder on its optic axis the cylinder axis is twice horizontal and twice vertical; the image formed on the retina is therefore twice erect and twice inverted; so that the image makes two full rotations to one of the cylinder. Koller has had constructed a small instrument which gets rid of the indistinctness of the image as seen with a single cylinder. This consists of two cylindrical lenses in a tube, the one convex and the other concave. These are fixed with their axes at right angles to each other, and separated by a distance equal to the sum of their foci. Such a combination by bringing the real and virtual focal lines into close approximation gives rise to what Koller calls stigmatic cylindrical images. Each point of such an image has the remarkable peculiarity that it is at the same time both *real* and *virtual*.

George A. Berry.

W. Dobrowolsky (St. Petersburg). Sensibility for Colours in the Retinal Periphery. *Von Graefe's Archiv., XXXII.,* 1, *p.* 9.

This paper gives the results of experiments undertaken to determine as exactly as possible the decrease of colour sensibility towards the periphery of the retina, the locality at which such decrease begins, whether it affects all spectral colours with equal rapidity and regularity, and, finally, whether at the extreme periphery the sensibility for all spectral colours vanishes symmetrically. The method employed was the same as that previously used by Dobrowolsky to determine central colour vision (*Vide* "Graefe's Archiv.," XVIII., 1, p. 67). It consists essentially in a combination of Helmholtz's ophthalmometer with a spectroscope. A small portion of the spectrum, including one colour only, is first exhibited to the eye under examination, and then the ophthalmometer plates are rotated, and the degree of rotation ascertained which produces a perceptible alteration in the colour. In testing the sensibility for red, the line C of the spectrum is selected, for yellow the line D, for green the line E, for blue the line F, and for indigo the line G.

One point observed by Dobrowolsky deserves especial notice. He found that in consequence of his frequent spectroscopic practice since 1872, the date of the first paper referred to above, the colour sensibility of his right eye had markedly increased, while that of his left eye, on the contrary, had remained unaltered. The left eye had only been very exceptionally used in spectroscopic experiments. The sensibility of the centre of the right retina, measured in degrees of rotation of the ophthalmometer plates, had greatly increased —for some colours by as much as one-half. Thus, for red it was increased by a little more than one-third, as 1 : 1·36; for yellow, green, and blue by nearly one-half, as 1 : 1·43 (or 1·45); and for violet by more than one-half, as 1 : 1·57.

Dobrowolsky finds, with Mandelstamm, that colour sensibility is most acute for the light of the line D, somewhat less for that of line F. König and Dieterici agree in placing the sensibility for these lines at the head of the list, but place F before D. They also discovered another locality in the

spectrum, the light of which produced a similar but lesser rise in colour sensibility between lines F and G, and Dobrowolsky corroborates this statement.

The paper is illustrated by tabular statements of the results. From them it is seen that sensibility for all spectral colours is most acute in the region of direct vision, and diminishes more and more towards the periphery. The decrease begins even in the region of the macula lutea, in the immediate neighbourhood of the fovea centralis. A rotation of the visual line to the extent of only one degree is sufficient to demonstrate this. The sensibility for all spectral colours decreases gradually towards the periphery, and as a consequence, the sensibility disappears soonest for those colours for which central sensibility is least acute. For instance, sensibility at the centre is lowest for red, and it ceases for this colour at 50° towards the nasal side of the retina, and 35° towards the temporal; sensibility for green at the centre is much higher, and it can be traced to 80° nasally and 50° temporally; for yellow and blue central sensibility is highest of all, and is demonstrable to 90° nasally and 65° temporally. It must be remembered that owing to the nearness of red to the end of the spectrum these experiments exaggerate sensibility for that colour. In fact, towards each end of the spectrum the ophthalmometer exhibits to the eye fields differing in brightness as well as in colour, and the value of sensibility for indigo must be also somewhat exaggerated, though not to the same extent as that for red.

Sensibility does not decrease with equal rapidity for all colours, but more slowly for those for which central sensibility is lowest, viz., red and green. For instance, at 5° inwards from the fovea, sensibility for red and green is $\frac{1}{14}$ of the sensibility for these colours at the centre, while for yellow and blue it is less than $\frac{1}{2}$. The outer half of the retina exhibits the same phenomenon; it also shows a more rapid decrease of sensibility for all colours than the inner half.

At the extreme periphery the relations are changed. Sensibility for red and green then diminish more rapidly than for yellow and blue, and that for yellow decreases more rapidly than that for blue, so that the latter can be higher than the former—a condition the reverse of what obtains in direct vision. In connection with this observation, the author refers

to König's and Dieterici's experiment, which showed that sensibility for blue increases as illumination lessens, while that for yellow remains unaltered. The complete analogy between peripheral colour vision and central colour vision, when the latter is tested by a low illumination, is well known.

Dobrowolsky's results may be summarised as follows:—*Line C:* From the fovea to 20° inwards and 5° outwards the retina can distinguish red from bright red; more peripherally. it can only differentiate dark red, first from orange, and finally from yellow. *Line D:* From the fovea to 35° inwards and 20° outwards the retina distinguishes between shades of golden yellow, yellow, and greenish yellow; more peripherally, only greenish yellow from orange and from bright red. *Line E* From the fovea to 20° inwards and 5° outwards, various shades of yellow-green and blue-green are differentiated. Nearer to the extreme periphery only yellow and blue can be distinguished. *Line F:* Near the fovea different shades of blue are distinguished; thence 20° inwards and 5° outwards blue is only distinguished from green-blue. *Line G:* For 20° inwards and 5° outwards indigo is distinguished from bright violet; more peripherally, only blue from dark violet.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 9TH, 1886.

J. W. HULKE, F.R.C.S., F.R.S., President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

The President announced the gift of Albrecht von Graefe's ophthalmoscope and blotting pad from Dr. A. Samelson, of Manchester. Also that he himself had presented to the Society the three ophthalmoscopes shown during his introductory address.

Living Specimens.—Mr. Adams Frost. A woman with symmetrical swelling in the region of the lachrymal glands. On the left side the swelling was so hard as to suggest a mixed fibro-cartilaginous tumour, such as was seen in the case of some parotid tumours.

Mr. Power reminded the Society that he had lately shown a somewhat similar case in a boy; the proptosis had become very great, and he had removed one gland; it was a simple overgrowth of fibrous tissue.

Mr. Jessop. A case of intra-uterine atrophy of the iris, the anterior epithelial layer being in great part wanting.

The President thought the case especially remarkable in that there was no evidence of affection of any of the other structures of the eye.

Mr. Jessop showed a boy with lamellar cataracts; he asked whether it was usual for the Y-shaped appearance of the striæ to be inverted at the front of the lens and upright at the back.

Mr. Silcock showed a patient with a large semi-circular hæmorrhage at the posterior pole of the eye just above the yellow spot. The question was whether this was due to rupture of a choroidal or a retinal vessel; Continental authorities all favoured the former view, English authorities the latter.

Mr. Nettleship thought the affection retinal. The retinal vessels which disappeared in the hæmorrhage were tortuous, whilst those below the macula were not tortuous. If the hæmorrhage had taken place into the choroid, one would see some retinal nerve fibres stretched over the clot, which was not the case here. After the blood had disappeared, a tolerably large retinal vessel sometimes came into view more or less blocked, being presumably the one from which the hæmorrhage had taken place. The shape of the hæmorrhage (almost always semicircular) was intelligible on the retinal hypothesis, but it was difficult to see why a choroidal hæmorrhage should be so limited.

Mr. Jessop said that in the last volume of the "Transactions" he had recorded a similar case where a large hæmorrhage cleared up, leaving only white spots along one of the retinal vessels.

Mr. Power had seen several such cases, and thought they were undoubtedly of choroidal origin, as a thin, delicate structure could always be seen over the blood. If the hæmorrhage were in the retina he was doubtful whether complete recovery would ever be met with.

Dr. Anderson mentioned a case of typical albuminuric retinitis with a large hæmorrhage at the fundus, which was, he thought, in the retina.

Mr. W. Lang. A woman, aged 25, with post-neuritic atrophy of the optic nerve, but good vision; she had had fits in childhood, and for the previous five years had been subject to "bilious attacks," with vomiting and giddiness.

Eyesight of School Children.—Mr. Jackman. A paper based on the examination of 456 children. Cases of ametropia were tested with and without a mydriatic, except in thirty-two cases of astigmatism in the Coggeshall Boys' School. In any doubtful case the cornea was examined through a + 10 D lens. The colour sense was examined by means of wools. The 456 children ranged from the age of 5 to 14, and were scholars at seven schools. The children were not in any way selected. The following percentages were found: Ametropia, 19·2; hypermetropia, 6·5; myopia, 2·17; astigmatism, 10·5; aniso-metropia, 5·04; colour blindness, 1·7; defective internal rectus, 8·7; strabismus, 2·8. Plans of the seven schools were taken, and the ratio between the window space and the floor space noted for each school. Upon comparing these results with the percentage of cases of myopia in each school, no connection could be traced between the two, as was evident from the table. The table given by the author showed the distribution of the myopes among the seven schools, the window and floor space of each school, and some details as to the health and nutrition of the children in the different districts; but seeing that the total number of myopes, as far as we can gather from the foregoing figures, did not exceed ten, such an analysis has no great value.

Mr. Adams Frost thought that Mr. Jackman had done good service in drawing their attention to other causes of myopia than defective light, but he held that it was rash to draw conclusions from so small a number of cases.

Mr. Power, referring to the differences between boys and girls, spoke of the close looking required in sewing; in hemming a cambric handkerchief thirty-six stitches to an inch were made. Lace-making, which went on at one of the schools, was also very fine work.

Mr. Edgar Browne said, in reference to lighting and window space, that the outside surroundings must be taken into consideration; it was essential that from every seat a strip of sky should be visible. In sewing, girls held their work at six inches or less from their faces.

Hydatid Cyst, causing Proptosis; Cysts in Liver, Lungs, Brain, and other Viscera; Unilateral Optic Neuritis. — Dr. W. A. Brailey. The patient, a female child, aged 2, was healthy till fourteen weeks before death; then the left eye did not close properly during sleep, and she used to wake screaming. Eight weeks later she was admitted to Guy's Hospital, and a little later, September 28th, to the Evelina Hospital. The liver had a bossy feel, the nodules varying in size from a pea to a walnut. Left eye protruded downwards and forwards; lids pinkish and slightly swollen, but sclerotic quite white. Lateral movements much limited; upward movement entirely wanting. Pupil active to light and accommodation; its indirect reflex action perfect. Optic disc swollen and ill-defined; veins large, dark, and tortuous. Vision on this side appeared good, as in other eye; fundus of latter quite normal. On October 4th, at 6 a.m., she was convulsed for forty minutes. On October 11th, the liver was apparently more distinctly nodular. The breathing was irregular, with a great many *râles* and rhonchi. October 13th, convulsed for over two hours; the convulsions began on the left, but were shortly transferred to the opposite side; right hand clenched; continuous jerking movement backwards of hand and arm; right leg slightly convulsed; right eye turned to the left, its pupil widely dilated; left eye much congested and protruded, jerked slightly. Breathing jerky and noisy. Temperature rose from normal at commencement of convulsion to 104·2°. Death twelve hours later. *Post-mortem* examination. A cyst the size of a large walnut in upper part of left orbit, displacing the eye forwards and downwards; it was within the superior rectus muscle, implicating it from near its origin up to its tendinous insertion; the muscular fibres expanded on the posterior part of the cyst, except on its lower and outer aspect; further forwards, all trace of them was lost, except on the extreme inner side, where they were continued as an attenuated layer up to the tendinous insertion. Cysts were found in liver,

lungs, spleen, right kidney, and left ovary ; none were found in peritoneum. A cyst, the size of a tangerine orange, was imbedded in the posterior superior part of the right cerebrum, occupying the region of the right angular gyrus and sub-marginal convolution. The cysts were those of the Tænia echinococcus.

Dr Hughlings Jackson thought the uniocular neuritis of great interest ; he was inclined to attribute it not to the local affection, but to pressure on the cerebral hemisphere by the cyst which was found there, and which probably caused the left-sided fits. He had only seen three cases of uniocular neuritis, all in hemiplegics, the neuritis being on the side opposite to the cerebral disease. Microscopical examination of the nerve might show whether there was any difference between this and ordinary double neuritis.

The President had seen two cases of hydatid of the orbit in young lads, and single in each instance ; after removal both patients recovered.

Mr. Nettleship asked if there was any local inflammatory condition of the orbit to account for the neuritis.

Dr. Brailey said he had supposed the neuritis due to the proptosis, but after what Dr. Jackson had said he was doubtful. The cyst was entirely in the muscular tissue. He would make a mieroscopical examination of the nerve.

Ecchymosis and Œdema of the Eyelids, without Obvious Cause. —Dr. Ormerod. In these cases the patient usually complains of his eye turning black, as if from a blow, in the course of a night, or in a few hours' time ; ecchymosis of the eyelids, or in some cases œdema only, is found. Usually pain in the eye or the head preeedes the attack, but no injury, and no fit. The attacks may be recurrent. Three such cases were given :—A man, aged 72, suffering from vertigo and pains in the head ; a woman, aged 54, suffering from paralysis of one arm ; a woman, aged 55, epileptie. Other cases were mentioned where similar " black eyes" were complained of by the patients. A definite explanation was not attempted, but the possibility of a connection with migraine was suggested by an observation of O. Berger's. The ecchymoses of tabes dorsalis show that extravasation of blood might be caused by disease of the nervous system.

Dr. Coupland referred to spontaneous hæmorrhages in the hysterical. He recollected a case of a young woman with symmetrical hæmorrhages on both sides of the body.

The President remarked that all the patients but one were advanced in life, and probably had diseased vessels; ecchymoses were very common after straining at stool or coughing.

Dr. Hadden mentioned the case of a medical man who had swelling of the lids, which lasted a fortnight, and had completely passed off; there was no albuminuria, and no local cause could be found. He also referred to the case of a young woman who had recurrent swelling of the lids without known cause. He thought that fugitive swelling of the hands, feet, or eye-lids was not uncommon.

Dr. Ormerod said that in only one case had there been no hæmorrhage, but in all there had been pain; straining could certainly be excluded in some of the cases—for example, those where it came on during sleep. Though the patients were past middle age, their arteries had appeared to be sound. He thought the paroxysmal nature of the affection was an important feature.

Case of Supposed Quinine Amaurosis.—Mr. Edgar Browne.—The patient was a powerful man, aged 34; had syphilis in 1884, and was carefully treated; was temperate; formerly a heavy smoker; general health perfect. Fell into the water at Shanghai on January 3rd, 1886; had a rigor next day, followed by pneumonia. Was told he took quinine to reduce temperature; believed the quinine was increased to thirty grains every two hours, but no professional note of this; thought he had taken about 120 grains, when he had "a confusion" in the ears, and became very deaf; there was a flickering before his eyes, and he suddenly went completely blind, "as if they had turned out the gas." Doubtful perception of sunlight, but could not perceive a candle a few inches from his eyes. Pupils were widely dilated. At the end of six weeks began to see objects in bright sunlight, and central vision rapidly returned. April 19th, pupils $3\frac{1}{2}$ mm., equal; acted to light and accommodation. Central colour-vision perfect. Vision: right eye, $\frac{20}{20}$; left eye, $\frac{20}{30}$. Slight paresis of internal rectus. No sign of syphilis, except a doubtful enlargement of posterior cervical glands. Patellar reflexes normal. Fields for white very

contracted ; greatest diameter nowhere beyond 20° from fixing-point. (Charts of fields for white and colours were shown.) Optic discs very pale ; vessels extremely small and contracted. Hearing perfect. December 4th, scarcely any change, except a slight failure in central vision of left eye. Fields unaltered. Could distinguish light from mirror up to the periphery. Health good. No sign of cerebral or spinal mischief, except perhaps the slight paresis of the rectus.

Mr. Browne had collected eighteen cases of quinine amaurosis including his own. The symptoms were blindness and deafness of marked character — deafness first in order of time, temporary in duration, and recovery rapid. Two cases got well in twenty-four hours, one in ten days, in one there was some permanent impairment. The onset of the amaurosis was sudden or very rapid, and more complete than was known in any other recoverable condition. It resembled the dense darkness of atrophy, for which one case was mistaken. In one case the deafness and blindness were so complete, that communication was only possible by touch. In cases examined early, a whitish haze with a central cherry-coloured spot was observed at the macula, as in embolism. The retinal vessels were always extremely contracted. In one case the contraction was first noted on the eighth day of the blindness, the first examination being on the fourth. The optic discs were pale, pupils always widely dilated, and insensible to light. In one case accommodation-reflex (convergence) was present ; hence it might be inferred that the state of the pupil was due to the blindness, and not to affection of the third or sympathetic. The mobility of the pupils was restored. The duration of the blindness was remarkable, no perception of light existing for three or four days, six weeks, and even seven months. Recovery of central vision when it commenced was rapid. There was central colour-blindness in early convalescence. In one case colour-blindness in the peripheral field was noted. A very marked contraction of the field was noticed. Out of eighteen cases, no contraction in four ; contracted for colour, one ; no notes, two ; great contraction, eleven. In one case there were central scotomata, but it was not noticed if the patient was a smoker. In some cases the field widened somewhat, but in pronounced cases it was never

fully restored. The sensitive portion of the retina corresponded to the non-vascularised space around the macula, the opposite of what obtains in axial neuritis. Recovery of central vision was generally perfect; permanent blindness had not been recorded. The quantity of quinine taken ranged from 180 grains in a single dose to forty-six grains a day for eight days in adults. An explanation of the symptoms was not easy. The resemblance to embolism or hæmorrhage into the optic nerve was obvious, but the bilaterism and complete recovery of central vision negatived these. The retinal ischæmia seemed local; there were no signs of general cerebral anæmia. The influence of the vaso-motor system must be considered. The first effects of toxic doses of quinine were felt in the labyrinthine circulation. It was supposed that the inferior cervical ganglion was especially affected, and that the condition was hyperæmia. It seemed unlikely that hyperæmia of the labyrinth should co-exist with retinal anæmia with the same mechanism, and the deafness was temporary, while the peripheral blindness was permanent. The affection was probably local. The occlusion of the arteries was not retro-ocular nor quite complete, or atrophy of the optic disc would be a probable sequence. There was no sign of periarteritis, nor was there any pressure, veins and arteries being alike attenuated. Quinine applied locally caused contraction of minute blood-vessels. Highly cinchonised blood, passing into a peripheral circulation unprovided with anastomoses, might deposit sufficiently to prevent the ingress of blood till such time as the contraction had become permanent. Information was needed on the appearances in the early stage of the amaurosis, whether the pupil reacted to myotics, what was the condition of the optic disc, and whether there was any fluorescence of media or retina.

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A NEW TONOMETER.

By Priestley Smith,

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Nearly ten years ago, being especially interested in the study of glaucoma, I devised a new form of tonometer with which to investigate certain questions relating to the intra-ocular pressure. A detailed account of the instrument and of various experiments connected with it may be found in a work published in 1879. ("Glaucoma: its Causes, Symptoms, &c." London: Churchill p. 27, &c.) It was, I think, correct in principle, and it did good service in the investigation referred to, but it was decidedly inconvenient to use, its readings being given by means of three separate pointers, the several positions of which had to be noted. I have lately devised a second instrument, similar in essential principle, but free from the inconvenience above mentioned; the three pointers are replaced by one, and the readings are obtained at a single glance. Before describing the new tonometer, it will be well briefly to consider the conditions by which all attempts at ophthalmo-tonometry are limited and controlled.

What we desire to estimate is of course the hydrostatic pressure of the intra-ocular fluids. Direct measurement of this is impossible in the living human eye, and we have to content ourselves with measuring, as an index to it, the resistance or tension of the wall of the eye. But the resistance of the wall of the eye bears no constant relation to the intra-ocular pressure; hence no kind of tonometer, however correct in principle and however faultless in construction, can enable us to measure the intra-ocular pressure with precision. It is important to recognise this fact, and to appreciate the sources of error.

The amount of resistance offered by the wall of the eye to external pressure depends chiefly upon the degree of the intra-ocular pressure, but it depends on other conditions also, namely :—

I. *The Elasticity of the Tunics.*—When an impression is made in the surface of the globe the underlying fluid is displaced and must be found room for elsewhere ; it is found room for more or less easily in proportion as the tunics are elastic and distensible. We know that the sclera varies in these respects, with age and other circumstances.

2. *The Pliancy of the Tunics.*—Apart from the general elasticity of the sclera, the wall of the eye is impressed more or less easily according to its pliancy or rigidity at the point of pressure ; thus, a given pressure makes a shallower impression in the ciliary region, where the wall of the eye is strengthened by the ciliary muscle, than nearer to the equator, where it is weaker ; and the pliancy of the cornea differs from that of the sclera.

3. *The Size of the Eye.*—Other things being equal, a large eye finds room for a given displacement of fluid more easily than a small eye, and is, therefore, more deeply impressed by a given pressure.

4.—*The Curvature of the Surface at the point of pressure.*—Other things being equal, a given pressure makes a deeper impression where the surface is sharply curved than where it is flatter, because the displacement produced is smaller in proportion. Eyes differ much in contour one from another, and the same eye is differently curved at different parts of its surface.

It is clear, therefore, that the tension or resistance of the wall of the eye, however accurately measured, can never become a precise index to the intra-ocular pressure, unless the influence of these modifying circumstances can be computed and allowed for, and to do this will probably remain beyond our power. Speaking generally

we may say that *with equal intra-ocular pressures, and other things being equal,* 1. A young eye will show a lower tension than an old eye. 2. A pliant wall, a lower tension than a rigid wall. 3. A large eye, a lower tension than a small eye. 4. A sharply curved surface, a lower tension than a flatter surface. But it is obviously impossible to estimate the many combinations in which these various influences may supplement or neutralise each other.

In estimating the value of the tonometer, it must be remembered that these same sources of error beset the digital method also. Neither the tonometer nor the finger can measure the intra-ocular pressure with accuracy, but a well-constructed instrument, properly applied, can measure the tension of the sclera more accurately than the finger, and it has the advantage of measuring without prejudice. Applied to the same spot of the same eye on successive occasions, a tonometer which is correct in principle will yield delicate indications of changes of tension ; applied to the two eyes of the same individual, if these are presumably a pair as regards their structure, it may, I think, be trusted to reveal smaller differences of tension than the unaided finger ; applied to the eyes of different individuals as a means of comparison, it will reveal small differences of tension, but cannot be regarded as a trustworthy indicator of very small differences of intra-ocular pressure. Its chief value undoubtedly is in the observation of *slight changes of pressure in one and the same eye.*—For a fuller discussion of this subject I would refer to an article by Monnik (Arch. f. Ophth. XVI., i.), and to my own work already referred to.

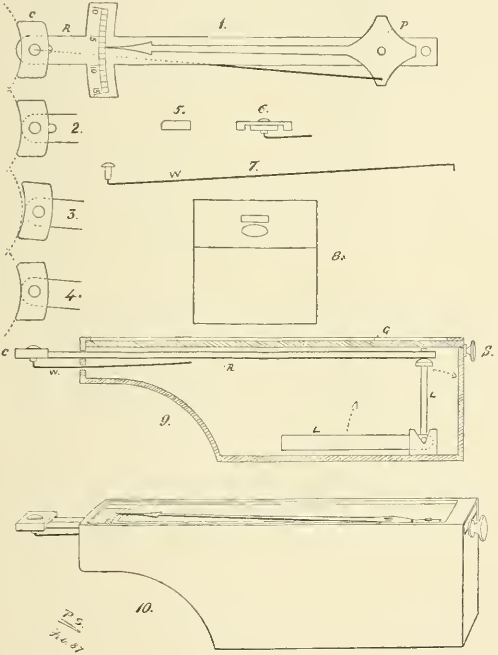
Of the many tonometers which have been invented, all which are worthy of the name have been based on the same fundamental principle ; they have been designed to indicate the relation between the amount of pressure employed and the depth of the impression produced. Other principles have been suggested, but it is probable, I think, that no other will be found to be

practically applicable. We may apply the principle above referred to in two ways:—(1) We may employ a pressure of known amount, and measure the depth of the impression which it produces; (2) we may produce an impression of known depth, and measure the pressure employed in producing it. I have adopted the former method because it is mechanically an easier matter to press upon the eye with equal force in every case than to make an impression of equal depth in every case. It is impossible, be it observed, for the operator so to control the action of his hand that a precise amount of pressure is reached, or that a pit of a precise depth is made, and then to stop; precision cannot be obtained unless the instrument of itself controls the pressure employed or the impression produced. The instrument must furnish the fixed quantity. The simplest way to obtain the fixed quantity is to employ a weight, which exercises a constant known pressure, irrespective of the action of the hand. The problem, then, is to measure the depth of the impression produced. The construction of my tonometer will be understood from the accompanying drawings, which show its actual size.

Figure 10 shows the instrument complete. It consists of an oblong brass box hollowed out underneath at the front, and closed at the top by a slip of glass, G (Fig. 9), which slides in like the lid of a box, and is held in place by a screw at the back. The glass slide retains the working parts in position; when it is removed, the whole instrument is readily taken to pieces.

Pressure is made upon the eye by means of the "ram" R (Fig. 1.), a piece of thin ivory having the shape of a cross, semi-circular in front where it touches the eye, and resting at the other end on the upright arm of a weighted lever L (Fig. 9.); the weight which forms the horizontal arm of the lever L is adjusted to balance a pressure of 10 grammes exerted horizontally on the front end of the ram.

On the upper surface of the ram at its front end lies a second piece of ivory, the "crescent" C; the anterior edge of which is hollowed to fit the convexity of the eyeball, the curvature being that of a circle 25 mm. in



diameter. Near to the hinder end of the ram is fixed a small upright pin which forms a centre of movement for the pointer P. The pointer is made of steel and lies flat upon the surface of the ram, being kept upon its pin only by the glass which is immediately above it. The

apex of the pointer travels over a milimetre scale engraved on the ram. The pointer is connected with the crescent by the wire W (Fig. 7). The hinder extremity of the wire is bent so as to drop into a hole in the pointer ; the anterior extremity carries a vertical pin which forms a pivot on which the crescent can to a certain extent rotate.

Fig. 8 shows the front of the box with its two apertures, the upper one for the ram to slide in, the lower for the passage of the wire.

The action of this mechanism will be readily understood. The operator holds the instrument horizontally, and applies the tip of the ram to the surface of the eyeball, making gentle steady pressure upon it. The ram dimples the wall of the eye, and depresses it until the resistance of the sclera becomes equal to the pressure exerted by the lever L ; the ram can then enter the eyeball no further, and begins to slide backwards in the box. The instrument is then removed from the eye. Meanwhile the crescent and pointer have registered the depth of the impression made. At the outset the edge of the crescent and the tip of the ram exactly coincide as seen in Fig. 2. As the ram advances, the crescent, which offers no resistance beyond the weight of the pointer, slides backwards and communicates its movement to the pointer. The pointer magnifies the movement exactly ten times, and the divisions of the scale indicate the depth of the pit in the eye, in 10ths of a millimetre.

It will be seen that the crescent is able to rotate to a certain extent upon the pivot which passes through it. This is a point of crucial importance. It is for want of some similar contrivance that some other tonometers otherwise good in principle are at fault. The depth of the pit can be measured only by ascertaining the position of the ram in relation to the undisturbed surface of the globe and for this purpose at least two points of contact with the globe are required outside the area of the depression. In some of the older tonometers the ram was surrounded by a tube, which was intended to supply

the fixed points on the surface of the globe. In the tonometers of Monnik and Adolph Weber (Graefe-Saemisch, Vol. III., p. 185), the tube is replaced by a two-pronged fork, as it were, the ram lying midway between the prongs. But we have here to measure small fractions of a millimetre, and it is impossible to apply a tonometer to the eye with such precision that the two outer rods or prongs shall impinge on the sclera at exactly the same moment ; one or other will almost always be more or less in advance, as I have proved by careful experiments (op. cit., p. 45), and it follows that if the outer rods are in one piece like a fork, so that both move when one touches the eye, the accuracy of the readings is interfered with. It is essential that the two outer rods, or whatever they may be, shall work independently of each other, or shall adjust themselves in such a manner as to indicate the mean position of the two. In my first tonometer I attained this end by using three separate rods, each connected with a pointer of its own ; the indications were good, but troublesome to read. The self-adjusting crescent in my second instrument obviates the difficulty. Fig. 3 shows the position of the crescent in relation to the eye-ball, when the instrument is applied obliquely, as it is, more or less, in every case. The one extremity of the crescent touches the globe before the other, but the crescent does not act upon the pointer until it has rotated upon its pivot and come into perfect contact with the eye, as shown in Fig. 4.

In using the tonometer the patient should be seated in a chair facing the window ; his head should be vertical, not sloped backwards ; he should look upwards at an angle of 45 degrees, or rather more. The surgeon, standing behind him, depresses the lower eye-lid with the fore-finger of the corresponding hand, right hand for right eye, left for left. He takes the tonometer in his other hand, steadies it by resting it lightly on the finger which is depressing the lid, and presses it gently and steadily against the eye at a point 4 mm. below the

cornea. The pointer begins to move, showing that the ram is dimpling the eye. The pressure is continued until the pointer refuses to move further, which shows that the ram will enter the eye no further. The tonometer is removed, and the position of the pointer noted. To set it ready for another application it is necessary only to hold it vertically for an instant with the crescent towards the floor ; crescent and pointer then fall back to their initial positions.

The only cause of failure which I have met with, so far as the instrument itself goes, is that moisture from the eye, drying upon the surface of the ivory, has occasionally gummed the crescent to the ram ; a touch will separate them, and a drop of water will clean the ivory. If the lower part of the sclera cannot be easily exposed by depressing the lid in the manner described, or if the patient is unable to keep the eye steady and to refrain from winking, it is useless to apply the tonometer.

As a means of testing its adjustment at any time, I have placed in the box which holds it a brass cylinder 25 mm. in diameter ; when the tonometer is applied to this the pointer should stand exactly at zero on the scale. If any adjustment is necessary it is made by slightly bending or straightening the wire W.

In the healthy eye, the depth of the pit indicated by my instrument is usually between ·6 and ·7 mm., but may probably exceed these limits in both directions. In very hard eyes the pit may be as small as ·25 mm., or perhaps smaller. In order to compare these readings with known degrees of intra-ocular pressure, I took a freshly excised eyeball, connected it by means of a hollow needle and elastic tube with a column of water, the height of which was adjustable at pleasure, and measured the tension of the sclera, at a point 4 mm. below the cornea, under a series of different pressures, closing the needle by means of a stop-cock immediately before each measurement. The following table shows the results. The readings given

are averages in round numbers of at least six measurements for each pressure. We know with tolerable certainty that the normal intra-ocular pressure is equal to somewhere about 30 cm. of water (op. cit., p. 97.)

Intra-ocular Pressure in Centimetres of Water.	Tonometer Readings.
25	·675
30	·625
35	·55
40	·5
45	·45
50	·4
55	·35
60	·325
65	·3
70	·275

Messrs. M. Ash and Sons, of 4, Bull Street, Birmingham, made the instrument for me, and will, if desired, make others like it. They tell me that the cost of future instruments will probably be three guineas. I append here certain details and dimensions which are essential, and which must be accurately adhered to in any modified form of this tonometer which may be made, if readings comparable with those of my own are to be obtained.

The ram, R, is 5 mm. wide ; 1 mm. thick ; its tip an exact semicircle ; its surface well polished so as to minimise friction with the crescent and with the aperture in the box. The oblong slot in the ram underneath the crescent is as smooth as possible, so that the pivot of the crescent slides in it with the least possible friction. The scale has a radius of 50 mm. from the centre on which the pointer turns ; it is divided into millimetres.

The crescent, C, is 5 mm. from front edge to back ; 10 mm. from side to side, with the corners sloped off so that the edge which actually bears against the eye measures only 8 mm. from point to point. This concave edge accurately fits the surface of a cylinder 25 mm. in

diameter. The crescent is 1·5 mm. thick; its under surface is recessed to receive the ram (see Fig. 6); the recess being wider than the ram so that the crescent may to some extent rotate upon its pivot. The upper corner of the concave edge is sloped off (see Fig. 5) so that the part which bears against the eye is only as thick as the ram, and on a level with it. The crescent turns very easily upon its pivot.

The pointer is of thin steel, but heavy enough to remain at rest while the crescent adjusts itself to the eye; *i.e.*, its resistance is greater than the force required to rotate the crescent. The two holes in the pointer are exactly 5 mm. apart, measured from centre to centre. The wire, W, passes through the hole in the box without touching it, and does not touch the ram; it should lie rather nearer to the ram than shown in Fig. 9, so as to be well clear of the lower eyelid.

The upright arm of the lever L supports the ram by means of a collar rounded on its upper surface. The horizontal arm is weighted so that the force driving the ram forwards is exactly balanced by a weight of 10 grammes acting horizontally in the opposite direction.

JAMES ANDERSON (London). Sensory Epilepsy; a case of Basal Cerebral Tumour involving the left temporo-sphenoidal lobe and the chiasma and optic nerves, and inducing optic atrophy and late optic neuritis. *Brain, October, 1886, p. 385*

The patient, a schoolmaster, aged 23 years, was sent to Dr. Anderson in August, 1885, with failure of vision in the left eye. He first knew that his left eye was defective in 1882, but it began to pain him and to fail rapidly in vision in August, 1884. The right began to fail in April, 1885. Six months before the rapid failure of the left eye the patient began to have paroxysmal attacks,—a bitter taste in the mouth, with a sensation of swelling in the right arm and occiput, and a dreamy state, in which a particular scene of his childhood came to his mind.

At first the attacks occurred at long intervals, and there was loss of consciousness for the few minutes, but latterly they became as many as fifteen per day, and then the scene ceased to come up to him, and also he was aware of what went on around.

The patient had been a healthy man, had never suffered from syphilis, and was a man of considerable intelligence. There was slight right facial paralysis, and left divergent squint, with a history obtained from Dr. Kirkwood, of Peterborough, of left neuroretinitis in August, 1884. Smell was almost absent in the left nostril, taste probably defective on both sides, hearing good on both sides. General sensation and motion, except as above, were normal, and at no time had there been headache, vomiting, or convulsion.

As noted, there was slight external strabismus of the left eye, noticed in 1882, and possibly present longer. Otherwise the movements of the globes were normal, and there was no ptosis. R. pupil $2\frac{1}{2}$ mm. acted well to light and with accommodation. L. pupil $3\frac{1}{2}$ mm. acted well with accommodation,

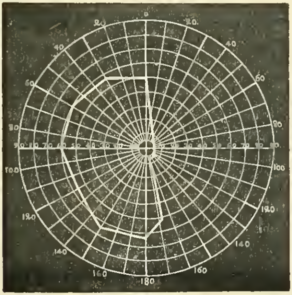


FIG. 1.—Right visual field of George B., August 21, 1885, for white object, 8 mm. square.

only consentaneously to light. V. of L. bare perception of light in temporal part of field, V. of R. $\frac{15}{20}$ partly and J. 1, also with + 2 D, the lens he was using. The R. visual field was of full extent on the nasal side, but crossed the vertical through the fixation point by only a narrow margin. The colour vision

and nasal half of the colour fields of the R. eye were normal. *Ophth.*—*L.* Disc dull white, edge sharply defined. Veins of normal size, arteries very slightly diminished. No perivascular thickening or evidence of past retinitis. *R.* Outer half of disc atrophic, glistening white; inner half still pink, although not so pink as it should be. Vessels normal. No perivascular thickening or exudation. Iodide and bromide of sodium was given, but in no way affected the progress of the case.

On October 23rd the mental condition was much deteriorated; there was extreme hebetude, and some affection of speech. The divergence of the mouth to the left was now better marked. There was slight ptosis on both sides, especially the left, but both lids could be raised on request, and there was no ocular paralysis. V. of L. doubtful p.l.; of R. $\frac{15}{70}$ and J. 16 with difficulty. R. visual field for a white object differed scarcely at all from that already recorded—temporal hemianopia. The fields for red and green were markedly and regularly contracted, especially the former. *Ophth.*—*L.* Paper-white atrophy of disc with small arteries and normal-sized veins. *R.* Inner part of disc still pink, but definitely paler than on last examination. Arteries and veins of fairly normal size. No other changes visible in fundi.

From this time till his death the mental hebetude gradually increased till his answers became incoherent. A brawny fulness came in the right side of his neck, which varied but did not disappear, and he became considerably fatter and more somnolent. Vision got gradually worse, and the nasal half of the right disc got so pale that it could scarcely have been distinguished from perfect atrophy; would certainly have been called so by an observer seeing it for the first time. The arteries, however, remained of full size, in marked contrast to the diminished arteries of the left side.

On December 28th he had a "fit" on getting out of bed, became "stiff all over," and remained unconscious for half an hour. When he became conscious he vomited, and this was repeated frequently till he was seen next day. He was semicomatose, but there was no aphasia or local paralysis. The edge of the right disc was now blurred as compared with its previous sharply-cut outline; the left remained in its condition of complete paper-white atrophy.

On January 17th, after repeated vomiting and giddiness on the 14th, the right disc was completely obscured by exudation, cloudy white in the centre, with a considerable hæmorrhage at its upper edge. A few more hæmorrhages subsequently appeared on the right disc, the reflex from which was now as red as the rest of the fundus; and some glistening white spots appeared near the macula. There was no change on the left disc. Latterly he was probably quite blind; the movements of the globes were less free than previously; but there was no definite ocular paralysis.

On March 4th he passed into a state of complete coma, and he died on March 6th.

The ocular symptoms in this case pointed definitely to a basal tumour pressing on the left optic nerve in the first place, afterwards involving the left half of chiasma and left optic tract, and finally involving the remaining fibres of the right nerve. From the paroxysmal taste sensation and dreamy state, and also from the similarity of a case published by Mr. Nettleship (Ophth. Soc. Trans., Vol. IV., p. 285), it was diagnosed that the tumour also involved the left temporo-sphenoidal lobe, and this diagnosis was confirmed by the autopsy. A large tumour was found, consisting centrally of a soft greyish structure, occupying the position of the inter-peduncular space, and excavating the bone in the neighbourhood of the pituitary fossa. Surrounding this were masses of steel-blue blood cysts, extending to the left and backward, undermining the inner aspect of the temporo-sphenoidal lobe. The right optic nerve, right half of chiasma, and right optic tract lay clear of the tumour, though much pressed by it. The left nerve and tract were so flattened out as to be almost indistinguishable.

Anderson discusses the nature of the tumour, and the bearing of the case on the pathology of epilepsy, and the localisation of cerebral function. From an ophthalmological point of view the case is interesting, mainly on account of the late occurrence of neuritis in the right eye, namely, nine weeks before death, although the tumour had almost certainly existed for four years, and possibly for longer. This neuritis was of the form usually produced by cerebral tumour, along with headache and vomiting. It occurred in a nerve already well advanced in

atrophy. The left nerve, which was completely atrophic, did not inflame. It had passed through a neuritis due probably to retrobulbar pressure, not to the presence of the cerebral tumour as such.

B. REMAK (Breslau). **On the Occurrence of Choked Disc in Cerebral Hæmorrhage.** *Berl. Klin. Wochenschr.*, 1886, *Nos.* 48, 49.

At a recent meeting of the Ophthalmological Society (O.R., 1886, p. 88), Dr. Bristowe recorded a case of double optic neuritis in cerebral hæmorrhage. There was a general agreement as to the rarity of the occurrence, and the necessity for a special explanation of it. Dr. Sharkey stated that there was no evidence of glioma in the neighbourhood of the clot, and suggested that the unusual position of the hæmorrhage, viz., in the posterior part of the left optic thalamus, rupturing the posterior part of the internal capsule, might explain the neuritis. The causal nexus does not seem clear. Unfortunately the optic nerves do not seem to have been examined, and considerable doubt must therefore remain as to the nature of the case.

Remak, in writing on the subject, uses the term "Stauungspapille," which we translate by "choked disc," but this "without prejudice," not allowing that any distinction can be substantiated between so-called choked disc and neuritis. He gives some account of the early literature of the subject, and quotes Leber, who admits that papillitis is almost never the direct result of intracranial hæmorrhage, but states that the hæmorrhage may burst into the base of the cranium, find its way into the intervaginal space of the optic sheath, and induce bilateral papillitis ("Graefe u. Sæmisch.," Vol. V., 2, p. 789). Hæmatoma of the optic nerve sheath is, according to Remak, the common factor of those cases where optic neuritis has supervened on intracranial hæmorrhage.

As bearing on the subject, Remak mentions eight cases of optic neuritis from fracture of the skull—six deaths, two recoveries. In several of these cases, the autopsies showed hæmatoma of the optic sheath, and this more marked on the side of the hæmorrhage into the cranial cavity, coinciding with a greater intensity of ocular symptoms during life. In a ninth case, however, recorded by Priestley Smith (Trans. O. S.

Vol. IV. p. 271), while there was copious effusion of fluid blood in the optic sheath there was within some hours of death no optic neuritis. Remak next cites cases of subdural hæmorrhage from pachymeningitis hæmorrhagica due to various causes, such as alcoholism, cerebral degenerations, scurvy, purpura, nephritis, &c., in which neuritis and intervaginal hæmorrhage coincided, although in many cases, of course, accompanied by severe retinal changes from the general affection; lastly, the group of cases to which Dr. Bristowe's belongs, hæmorrhage into the cerebral substance with optic neuritis. These are due either to rupture of an aneurysm or rupture of a vessel not aneurysmal. The aneurysm has generally been at the bifurcation of the internal carotid, and the hæmorrhage has been of considerable magnitude. Under the latter head Remak gives five cases, the last observed by himself. In some of these the nerves were not examined post mortem, but the last two were fully observed in this point.

Remak attributes the neuritis to (1) compression of the central vessels by the clotted blood in the intervaginal space, which may be accompanied by more or less inflammation; and (2) the interruption to the return of lymph from the eye through the intervaginal to the subdural space, shown by œdema of the retina and papilla and the ampullar dilatation of the anterior part of the optic sheath, filled with lymph which has come not by regurgitation from the subdural space, but from the globe itself. Remak would explain the absence of neuritis in Priestley Smith's case by the absence of one or other of these factors, *e.g.*, if the blood were quite fluid, and, therefore, did not cause obstruction to the flow of lymph.* He considers that the rise of intracranial pressure due to hæmorrhage is too temporary, *i.e.*, too soon causes death to allow of its being a factor in the production of optic neuritis.

In conclusion, Remak mentions as a caution a case admitted comatose with hemiplegia and neuro-retinitis, in which intracranial hæmorrhage with hæmatoma of the optic sheath was diagnosed. The man, however, recovered consciousness, the neuritis gradually subsided, and when he died some weeks later, the autopsy showed granular contracted kidneys, but no trace of cerebral or intervaginal hæmorrhage.

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* The blood probably entered the nerve sheaths only a few hours before death. (*Vide loc. cit.* p. 274.)—P.S.

J. R. DA GAMA PINTO (Heidelberg). On the treatment of Prolapse of the Iris in Corneal Ulceration. *Klin. Monatsbl. f. Augenheilk, Jan.*, 1887, *p.* 1.

The author points out that there is at present no common agreement as to the best method of dealing with prolapsed iris in cases of perforating ulcer. Some surgeons simply wait for spontaneous shrinking and cicatrisation; others attempt to expedite matters by abcising or repeatedly puncturing the prolapsed membrane. In either case an anterior synechia follows, and leaves the eye liable to persistent irritation, to increased tension, and even to destruction through the entrance of septic germs. The aim in all such cases should be to obtain healing without synechia, and if this be impossible by means of atropine and eserine, surgical measures should be employed. The author has devised and successfully employed a new method.

Assuming that the prolapse is not of too long duration, the operation is performed as follows:—Chloroform is given in order that each step may be carried out with precision. The prolapsed portion of the iris is seized with toothed forceps, pulled gently in various directions, and at the same time freed by means of a fine probe from its adhesions with the cornea, and then cut off with a single snip of the scissors. The aperture in the cornea is then covered and stopped with a piece of conjunctiva from the same eye. The conjunctival graft should be from once and a half to twice the size of the raw surface of cornea which is to be covered; it is taken from the sclera, laid with its raw surface upon that of the cornea, and gently pushed into the opening of the latter by means of a probe. The eye is firmly bandaged and not examined until the third day.

Details of several cases are given. In one case, the author freed the prolapse from the corneal wound with a probe as above described, cut it off with scissors, and obtained healing without synechia, the corners of the coloboma being free. The only drawback here was that firm closure of the aperture was long in taking place. Although the anterior chamber was rapidly restored, it began to leak again four days later, and the wound, after tardy healing, again gave way more than a week afterwards. The delay appeared to be due in part to the presence in it of a plug of iodoform powder.

In the next case he determined to use no iodoform, and to close the aperture by a conjunctival graft, proceeding in the manner already described. At the first examination, on the third day after the operation, the chamber was re-established and deep, the graft being highly vascularised and somewhat bellied outwards; the cure went on without interruption, and the junction of the graft with the cornea became quite invisible.

In a second case of grafting the graft appeared to unite at first, but on the fifth day was cast off, probably by reason of the purulent infiltration of the corneal surface to which it was applied. Even in this case it appeared to act beneficially, by forming a provisional covering for the aperture. The wound healed well.

In a third case, in which the operation was done by Professor Becker, the prolapse was very small, and it proved impossible to completely break down the adhesion between iris and cornea; the graft united well, the chamber was rapidly restored, and at the end of fourteen days traces of the grafting were only discoverable with a magnifying glass.

The author suggests that such grafts may perhaps prove useful in cases of corneal fistula, and of persistent hernia of Descemet's membrane; in such cases it would be necessary to vivify the spot with the trephine. He notes that Professor Kuhnt, of Jena, had previously applied with success a conjunctival graft to the surface of an ulcerating cornea; in that case, however, there was no perforation.

J. FAYRER, K.C.S.I. (London). Rules Regarding Defects of Vision which Disqualify Candidates for Admission into the Various Departments of the Indian Government Service; with Appendix containing the Regulations as to Range of Vision Necessary to Qualify a Candidate for Admission into the Royal Navy, British Army, and Civil Service. *London: J. and A. Churchill.*

This pamphlet, as its title shows, supplies information which is much wanted by medical men, who, though not Government officials, are consulted from time to time as to the sufficiency of certain degrees of eyesight for the public services. Sir

Joseph Fayrer writes that, as President of the Medical Board at the India Office, he has for many years experienced the inconvenience of having no clearly defined rules on the subject. He referred the whole question to Messrs. C. N. Macnamara and John Couper; the rules which are now published, with a brief and clear statement of the nature of refractive errors, and the methods of determining them, were prepared by these gentlemen. The rules are sanctioned by the Secretary of State for India, who, nevertheless, reserves to himself an absolute right to reject at his discretion any candidate whom he may consider to be, for any physical reason, unfitted for the service he desires to enter.

We quote the following rules, but would recommend that anyone who may have to advise in connection with them should consult the original, in which further information is given.

The Civil Service.

(*Covenanted and Uncovenanted.*)

1.—A candidate may be admitted into the Civil Service of the Government of India if ametropic in one or both eyes, provided that with correcting lenses the acuteness of vision be not less than $\frac{6}{9}$ in one eye, and $\frac{6}{6}$ in the other, there being no morbid changes in the fundus of either eye.

2.—Cases of myopia, however, with a posterior staphyloma of the non-progressive form, may be admitted into the service, provided the ametropia in either eye do not exceed 2·5 D., and no active morbid changes of choroid or retina be present.

3.—A candidate who has a defect of vision arising from nebula of the cornea is disqualified if the sight of either eye be less than $\frac{6}{12}$; and in such a case the acuteness of vision in the better eye should equal $\frac{6}{6}$, with or without glasses.

4.—Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the Indian Civil Service. In the case of a candidate said to have been cured of strabismus by operation, but without restoration of binocular vision, if with correcting glasses the vision reach the above standard (1), and if the movement of each eye be good, the candidate may be passed. The same rule applies to the case of unequal ametropia without binocular vision, both eyes having full acuteness of vision with glasses and good movement.

Candidates for admission into the following departments come under the rules laid down for the Civil Service:—Ecclesiastical, Education, Salt, and Opium.

Candidates for the departments of Public Works, Forest, Survey, Telegraph, Railway, Factories, as well as Police, and various artificers, may be admitted into the service under the following rules:—

1.—If myopia in one or both eyes exist, a candidate may be passed, provided the ametropia do not exceed 2·5 D., and if with correcting glasses, not exceeding 2·5 D., the acuteness of vision in one eye equal $\frac{6}{9}$, and the other $\frac{6}{6}$, there being normal range of accommodation with the glasses. If the myopia be associated with posterior staphyloma, and there be evidence of active morbid changes in the choroid or retina, the candidate should be rejected, however slight his myopia.

2.—Myopic astigmatism does not disqualify a candidate for the service, provided the combined spherical and cylindrical glasses required to correct the error of refraction do not exceed − 2·5 D.; the acuteness of vision in one eye, when corrected, being equal to $\frac{6}{6}$, and in the other eye $\frac{6}{9}$, together with normal range of accommodation with the correcting glasses, there being no evidence of progressive disease in the choroid or retina.

3.—A candidate having latent hypermetropia not exceeding 4 D. is not disqualified, provided the sight in one eye (when under the influence of atropine) equal $\frac{6}{9}$, and in the other eye equal $\frac{6}{6}$, with + 4 D., or any lower power.

4.—Hypermetropic astigmatism does not disqualify a candidate for the service, provided the combined lens required to correct the error of refraction do not exceed 4 D., and that the sight of one eye equal $\frac{6}{9}$, and the other $\frac{6}{6}$, with or without such a lens.

5.—A candidate having a defect of vision arising from nebula of the cornea is disqualified if the sight in one eye be less than $\frac{6}{12}$. In such a case the better eye must be emmetropic and possess normal vision. Defects of vision arising from pathological or other changes in the deeper structures of either eye, which are not referred to in the above rules, exclude a candidate from admission into the service.

6.—A candidate is disqualified if he is wholly unable to distinguish the principal colours (Achromatopsia).

7.—Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the Indian Military Service. In the case of a candidate said to have been cured of strabismus by operation, but without restoration of binocular vision, if with correcting glasses the vision reach the standard given in Rule 1, "Civil Service," and if the movement of each eye be good, the candidate may be passed. The same rule applies to the case of unequal ametropia without binocular vision, both eyes having good movement and full acuteness of vision with glasses.

Candidates as guards, engine-drivers, signal and pointsmen on the Indian railways, come under the rules prescribed for the Pilot Service.

Persons entering the Government Service on special duty must possess such an amount of acuteness of vision as will, without hindrance, enable them to perform the work of their office for the period their appointment may last.

The Indian Medical Service.

(*Covenanted and Uncovenanted.*)

1.—A candidate may be admitted into the Indian Medical Service if myopic to the extent of 5 D., provided that with correcting lenses his acuteness of vision in one eye equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, there being no morbid changes in the fundus of the eyes. Cases of myopia, however, with a posterior staphyloma, may be admitted into the service, provided the ametropia in either eye do not exceed 2·5 D., the acuteness of vision with correcting glasses being equal to the above standard, no active morbid changes of choroid or retina being present.

2.—Myopic astigmatism does not disqualify a candidate for the service, provided the combined spherical and cylindrical glasses required to correct the ametropia do not exceed - 5 D.; the acuteness of vision in one eye when so corrected being equal to $\frac{6}{12}$, and in the other eye $\frac{6}{6}$; the accommodation being normal with the correcting glasses, and no progressive morbid changes of the choroid or retina being present.

3.—A candidate having latent hypermetropia not exceeding 5 D. is not disqualified for the service, provided the sight in one eye (when under the effect of atropine) equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, with + 5 D. or any lower power.

4.—Hypermetropic astigmatism does not disqualify a candidate for the service, provided the combined lens required to correct the latent hypermetropia do not exceed 5 D. The acuteness of vision in one eye must equal $\frac{6}{12}$, and in the other $\frac{6}{6}$, with or without the correcting glass.

5.—A candidate may be accepted with a faint nebula of one cornea, reducing the vision to $\frac{6}{12}$, provided the eye in other respects be healthy. In such a case the better eye must be emmetropic and possess normal vision. Defects of vision arising from pathological or other changes in the eye, which are not referred to in the above rules, exclude a candidate for admission into the Indian Medical Service.

6.—A candidate is disqualified if he cannot distinguish the principal colours, red, green, violet or blue, yellow, and their various shades (Dischromatopsia).

7.—Paralysis of one or more of the exterior muscles of the eyeball disqualifies a candidate for the Indian Medical Service. A candidate may be accepted who is said to have been cured of strabismus by operation, but without restoration of binocular vision, if with correcting glasses the vision come up to the standard laid down in the above rules, and if the movement of each eye be good. The same rule applies to the case of unequal ametropia without binocular vision, both eyes having full acuteness with glasses and good movement.

The Pilot Service.

1.—A candidate is disqualified unless both eyes are emmetropic, having absolute acuteness of vision and range of accommodation.

2.—A candidate is disqualified by any imperfection of his colour sense.

3.—Strabismus, or any defective action of the exterior muscles of the eyeball, disqualifies a candidate for the Pilot Service.

The Marine Service.

(Including Engineers and Firemen.)

1.—A candidate is disqualified if he have an error of refraction in one or both eyes which is not absolutely neutralised by a concave or convex 1 D. lens, or some lower power.

2.—A candidate is disqualified if he cannot distinguish the primary colours and their various shades, red, green, violet or blue, and yellow.

3.—Strabismus, or any defective action of the exterior muscles of the eyeball, disqualifies a candidate for the Marine Service.

It is to be hoped that the rules for the military service of Great Britain, and for the Royal Navy, may in like manner be formulated and published. If we may judge from the information given in the appendix, the methods and regulations at present in force are somewhat wanting in precision; thus it appears that candidates under examination are, in some instances, allowed to use the glasses with which they have provided themselves prior to the examination; in others they are required to select the glasses which suit them from a number of pairs of spectacles placed on a table in the examination room. Further, it would seem that while simple myopia and hypermetropia do not disqualify for certain positions, astigmatism is prohibitory. In the new rules for the Indian service cylindrical lenses stand on the same footing as spherical.

Sir Joseph Fayrer's regulations should be on the shelf of every British oculist.

George A. Berry (Edinburgh). Subjective Symptoms in Eye-Diseases. *Edinburgh: Oliver & Boyd. London: Simpkin, Marshall, & Co.*, 1886.

The author of this work urges, and unquestionably with good reason, that the perfection of our present means of examining the eye objectively tends to bring into undue prominence some of the faults and changes which are seen, or are supposed to be seen, with the ophthalmoscope, and to

withdraw attention from subjective symptoms. He refers to the exaggerated statements which have been made as to the evidence yielded by the fundus oculi concerning changes in the circulation of the brain; to the practical errors which arise when faults of refraction are dealt with from the merely objective point of view; to certain brain diseases in which objective examination supplies uncertain evidence or none at all, while subjective methods may reveal not only the presence but the site of the lesion; and so forth. He does not, of course, deny the great value of skilful and precise objective examination, but urges that results so obtained should be systematically controlled by subjective methods.

The book consists of rather more than 100 pages, and deals in succession with the following subjects:—(1) pain; (2) diplopia, polyopia; (3) night-blindness, day-blindness; (4) metamorphopsia; (5) photopsia, chromatopsia, myodesopsia (the perception of shadows, floating specks, &c.); (6) defects of the light and colour senses—amblyopia and amaurosis; (7) limitations of the field of vision. It is impossible to make a satisfactory abstract of such a book; each chapter should be read as a whole and will well repay the labour. The writer has supplemented his own clinical experience by wide reading and the use of a well-trained critical faculty, and has elaborated a most interesting work.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

Thursday, January 27th, 1887.

E. Nettleship, F.R.C.S., Vice-President, in the Chair.

Treatment of Conical Cornea.—Mr. Cowell. Three men with conical cornea, treated by transverse incision. Books say that conical cornea is commonest in women; this was not his experience. Two of his patients had asked that the second eye might be operated upon, so pleased had they been with the results.

Dr. Brailey believed conical cornea to be more common in women. He always made a vertical incision, but lately had simply grooved the cornea vertically, and put a stitch through, bringing the grooved edges together.

Mr. Higgens had found it commonest in women, and in hypermetropic eyes; after operation the sight was much improved by a convex lens.

Mr. McHardy had seen it only in women or in quite young men. He preferred trephining to removing an elliptical flap; but, in favour of the latter, there was less pain and better retention of aqueous fluid. The horizontal incision was preferable to the vertical.

Mr. Critchett said that anterior synechia probably followed in fifty per cent. of the cases, and iridectomy was necessary. He therefore commenced by a very small iridectomy; ten days later he made a similar one outwards, and then removed an elliptical portion.

Mr. Lang thought the incision should not be wider than the size of the pupil, and thus adhesion between the iris and cornea could be avoided. He made a short ellipse, nearly circular.

Mr. Hartley agreed with the last speaker, and had been struck with the apparent length of cicatrix in the cases shown.

Mr. Cowell claimed no originality for the operation; it presented fewer inconveniences than others. He never used suture; it set up irritation. The two surfaces of the cornea adapted themselves better if the incision was not too short.

Calcareous Film of Cornea.—Mr. Marcus Gunn. A living specimen of transverse calcareous film of both corneæ. The left eye had defective vision, and originally squinted. The chief features of interest were the causation and treatment. The man was a blacksmith, and had been exposed to blasts of cold air as well as to great heat. The vision in the right eye was still fairly good. Mr. Gunn proposed to scrape away the calcareous matter. There had been no keratitis or iritis. There was no family history of gout or rheumatism. The film reached to the extreme inner edge of the cornea, but did not slope. In these two features it differed from those shown by Mr. Nettleship.

Retinal Hæmorrhage.—Mr. W. H. Jessop. Sequel to his case of large semicircular hæmorrhage (Trans., O.S., VI., p. 335). The eye had recovered with perfect vision, and without a scotoma. He concluded that the extravasation had probably occurred into the nerve-fibre layer.

Mr. Quarry Silcock said that the case of large hæmorrhage shown by him at the last meeting had resulted in a white patch of choroidal atrophy, which therefore justified his calling the case choroidal rather than retinal hæmorrhage.

Detachment of Retina.—Mr. W. Lang. Central detachment of the retina of obscure origin in a widow, aged 63, a sempstress.

Exostoses of Skull, with Atrophy of Optic Nerves.—Mr. E. Nettleship. Congenital multiple symmetrical exostoses of the skull, with post-papillitic partial atrophy of the optic nerves. The boy, aged 12, was much undergrown, but fairly healthy and intelligent. There were very large and perfectly symmetrical smooth exostoses in the temporal and mastoid regions and on the outer wall of each orbit, laterally, at or near the situation of the anterior and posterior fontanelles in the middle line. The coronal suture could be felt as a groove on the temporal and anterior median exostoses. At the sides of the root of the nose there was a gap between the nasal processes of the frontal and of the superior maxillary bones, but the central ridge formed by the nasal bones was normal. Numerous large veins emerged from or passed into the gap on each side of the root of the nose; and others were seen in the temporal regions. The eyes were too wide apart, the orbits being separated apparently by expansion of the median bones. When the mouth was opened the lower jaw was dislocated forwards, but without causing inconvenience; probably the shape of the glenoid cavity was much altered. The roof of the palate was very high and narrow anteriorly; with this exception, the facial bones seemed natural. Smell and hearing good. No other deformity. Both optic discs pale, with clear evidence of former inflammation. The left showed more change than the right. Vision defective; less than $\frac{6}{60}$ with either. Hypermetropia, 3·5 D. The head was of its present shape at birth, but the bosses had become less conspicuous as he had grown. The sight had been in its present state all his life, so far as could be ascertained. There were no other cases in the family.

Unusual Clinical Cases.—Dr. Mules. (1.) *Pseudo-sarcoma of iris.* A case of solitary gummatous tumour of the iris simulating sarcoma, in a child aged 13 months. There was no iritis or other appearance of syphilis. The growth was dispersed by mercurial inunction in seven weeks, leaving the eye

normal. (2.) *Extensive crescentic ulcer of the cornea* (Wecker's malignant ulcer), with splitting of the corneal layers to the apex, permitting the passage of a probe (a very rare condition), occurring in a man aged 54, arrested by scraping and iodoform. The case gave proof of the efficacy of scraping and antiseptics. (3.) *Corneal ulcer* in a man, aged 56, suffering from Graves's disease, painful, and complicated by posterior synechia. All minor treatment failed, and the cornea being in imminent danger of destruction, the lids were united over four-fifths of their length. The pain was at once relieved, and the ulcer healed rapidly without further treatment. The interest of this case was accentuated by the record of corneal losses from Graves's disease recently published. (4.) *Double auto-extraction of cataract*, the result of accident, in a man aged 67, with retention of useful vision in both eyes. (5.) *Foreign body retained in globe:* a dart from "puff and dart," encapsuled for eleven days. (6.) *Scleral hernia* from direct violence on the front of the eye; media transparent. Papilla with an irregular margin of sclera, forced out and destroyed; central artery reduced to white lines; vein retaining its normal patency. It was believed that this was the only case in which this accident had been observed.

Mr. G. A. Berry had seen the case of exopthalmic goitre, and the result was most satisfactory. Was it necessary to pare the edges before bringing the lids together? He had lately seen an analogous case with good results, in which the edges were left alone.

Mr. Critchett mentioned the case of a lady who had nine months previously been shot through one eye, and, on enucleation, the dart was found to have passed partly out of the eye, and was lying in the orbit.

Mr. Higgens thought crescentic ulcers more amenable to eserine and bandaging than any other method of treatment.

Dr. Brailey thought that cases where there was no infiltration of the base of the ulcer did best with eserine; where there was infiltration, the galvano-cautery was very useful.

Mr. Marcus Gunn said that in one case of fairly clear, greyish, serpiginous ulceration, extending half round the cornea, he had employed the galvano-cautery with success.

Mr. Snell spoke highly of the value of quinine when given in two-grain doses three or four times a day.

Three Cases of Acute Cerebral Disease with Ocular Symptoms
Mr. G. A. Berry. *Case* 1.—Acute ophthalmoplegia externa in a little girl, aged 2½. There was a history of gastro-enteric catarrh five months before admission. The present illness began three weeks ago with cough and headache. Ten days before, something was noticed wrong with the sight. There was almost complete ptosis of both eyes, with absolute divergence of the eyeballs—in fact, a condition of almost complete ophthalmoplegia externa. The child was mentally very apathetic; once she had a severe screaming fit; the knee-jerks were absent. After treatment by iodide of potassium for two weeks, distinct improvement in the general condition began, and the ophthalmoplegia was less marked. There was a scrofulous condition of one finger; perhaps the condition was dependent on tubercular disease about the ocular nuclei.

Case 2.—Megrim associated with spasm of convergence, in a girl aged 18, possibly hysterical. On one occasion the patient had an attack of apparently insurmountable conjugate deviation of the eyes to the left. Extraordinary abnormalities of the temperature of the body were observed. The corpora quadrigemina or the cortex might be the seat of the lesion.

Case 3.—Recurrent attacks of bitemporal hemianopia. The patient was a man, aged 53, who had suffered from headache and drowsiness. Both temporal halves of the fields of vision were extremely defective up to about 5° from the points of fixation. On six occasions, at intervals of about one week, and for three or four days, vision became affected, and the temporal fields of vision were dimmed or obliterated, whilst at the same time the heart's action was markedly slower than during the periods of intermission of the ocular symptoms. Pressure on the chiasma in an antero-posterior direction might be the cause of the hemianopia.

Dr. Gowers said the cases were difficult. He agreed with Dr. Berry that it was highly probable that different cases of ophthalmoplegia externa had different pathological lesions, and were not all due to degenerative changes, especially judging from what was known of ophthalmoplegia interna. For instance, loss of light-reflex, usually attributed to degeneration, might pass away even in tabes. Where recovery took place, the lesion could not be a destructive one, though there might be

some nutritional change. With regard to the first case, he doubted whether it could be due to distension of the aqueduct, or to a simple tubercular lesion. Distension of the aqueduct was frequently met with without paralyses of the ocular muscles. Sudden lesions were generally vascular; thrombosis was common in children; in this case it was probable that a thrombus had occurred in the artery leading to the ocular centre. The second case he agreed was not one of hysteria. Divergent strabismus was conclusive against hysteria. As to the third case, no doubt internal hydrocephalus was an occasional cause of pressure on the chiasma, and blindness. He referred to a case where, first the decussating, and afterwards the non-decussating fibres of the chiasma were affected by the distension of the third ventricle.

Mr. Waren Tay referred to one of Mr. Hutchinson's cases, in which recovery took place.

Dr. Sharkey could not accept the tubercular theory in the first case; many acute cases resembled tubercular disease and got well, but there was no good evidence of recovery after tubercular disease of the brain. In one case he had found a diffuse inflammation of the cerebral ganglia when there had been sudden onset. He would regard the present case as of that nature rather than as a case of thrombosis.

Mr. Berry, in reply, thought a vascular lesion in the first case very probable. He had, however, seen a case of ophthalmoplegia externa due to inflammatory lesions. Spasm of convergence was, in his experience, uncommon, paralysis being by no means rare.

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AN ADDRESS

ON

THE LIFE AND SCIENTIFIC WORK OF ALBRECHT VON GRAEFE.

Delivered on the occasion of the Presentation of the Graefe Medal to Professor Von Helmholtz,

BY PROFESSOR DONDERS, OF UTRECHT,

TOGETHER WITH

THE REPLY OF PROFESSOR VON HELMHOLTZ.*

The Graefe medal, recently instituted by public subscription, in perpetual memory of Albrecht von Graefe, is awarded every ten years by the Ophthalmological Society, meeting annually at Heidelberg, to the man of whatever nation who may be designated as having rendered the greatest service to ophthalmology.

The ceremony of the first presentation of the medal took place at the close of the Quincentenary Festival of the University of Heidelberg, on the 9th of August, 1886. Professor von Zehender, of Rostock, presiding, in presence of the Pro-Rector, Professors, and many distinguished visitors. The President, having opened the assembly in a few appropriate words, called on Professor Donders, of Utrecht, who spoke as follows :—

The days have but just passed in which the University of Heidelberg has brilliantly celebrated its quincentenary festival. From a brilliant present, it can look back with pride upon a glorious past, which displays in every field of human knowledge, both great men and great results. Here, on the beautiful banks of the Neckar, has ophthalmology, too, been wont annually to pitch its tent from the dawn of its most

* The English translation of this most interesting and historically important address was condensed and revised for publication by Professor Donders and Sir William Bowman. We reprint it from the "British Medical Journal" for December 11th, 1886, and in so doing desire to express our indebtedness to that journal. The German original was given in full in a Supplement to the "Klinische Monatsblätter" for 1886.

modern era. Under the shade of Alma Mater, the Ophthalmological Society was born. It invites you this year to a festival commemoration, and to me has been entrusted the honourable task of addressing you.

It was in the autumn of 1857 that Albrecht von Graefe met here for the first time with some of his followers, among whom were Horner, von Zehender, and Weber, in order to discuss the most recent advances in ophthalmology. In the next year there appeared also, by von Graefe's invitation, Arlt, Müller, and myself. From Heidelberg, there were also present, Kussmaul and many others. In 1859, the publication of the transactions was resolved on. So far, the assemblage had the form of a congress: every member had the right to introduce friends, and every member of the profession might enter. In 1863, it first formed itself into a "Society," but with very liberal rules, by which the committee was empowered to admit into the society, on the nomination of two members, those oculists who had given evidence of scientific aims. In 1864, it counted already more than eighty members, and among them, Baum, Reute, Coccius, Busch, and Forster, from Germany; Arlt, Gulz, Stellwag von Carion, and Hasner von Artha, from Austria; Sichel and Desmarres, from France; Bowman, Critchett, and Mackenzie, from the United Kingdom; besides von Zehender, Horner, Hairion, Warlomont, Snellen, Hoyack, MacGawly, Junge, and Szokalsky, from the other countries of Europe. Soon their numbers were swelled by the presence of Williams, Agnew, and others from America, and thus the society had assumed already an international character.

Albrecht von Graefe both was and remained the soul and centre of the society till his strength failed him. He died on July 20th, 1870, on the eve of the great struggle with France, at a time when Germany could spare comparatively little sympathy for the quiet death at home of one of her eminent sons. But when, in the following year, peace having been restored, the members of the society again gathered here, a universal desire was expressed to do homage to his memory. In the first place, so thought his nearest friends, the opportunity must be widely afforded of contributing to a monument to the great ophthalmic surgeon who had made all mankind his debtors; and, as the result of their united exertions, under the presidency of von Langenbeck, they may look upon the statue, raised in 1882, near the chief scene of his activity, his native city, Berlin. But, beyond this, the society desired to render a special homage to its founder. Should they endow scholarships in ophthalmology? Should they seek to perpetuate his name by a charitable institution—an Eye Hospital? But then came the idea of founding a Graefe medal, to be

presented every tenth year to the man who, among his contemporaries, should have most powerfully contributed to the development of ophthalmology; and this idea was almost universally approved. And must not every doubt as to the wisdom of the decision be silenced, when we see to-day Hermann von Helmholtz "thankful," as his telegram puts it, "that his old work should be remembered with fresh honours," ready to accept the medal thus unanimously awarded to him?

A double task is now imposed upon me. The statutes decree that the presentation of the medal, with an address to the recipient, must be preceded by a discourse commemorating the merits of Albrecht von Graefe. This task I joyfully undertake. On the one hand, it will always be easy to connect the results of the present day with those of the man whose grand figure stands at the commencement of an era of which we seem to see no end. I have the privilege of being able to speak, and in this intimate circle I may venture to speak, in the first place, from my own personal recollections.

Albrecht von Graefe himself showed me the house in which, on May 22nd, 1828, he first saw the light, a stately mansion which his father, the first Director of the Surgical Clinique of the University, owed to the munificence of his King, Frederick William the Third. His father remained his guide only up to his twelfth year, but his mother was spared to exert a happy influence over his career for eighteen years more. No pains were spared in his education. After receiving private instruction from the best tutors, he attended the French gymnasium. Chance has thrown into my hands a report of the Director Kramer upon our Graefe. Two significant words in it struck me, "Attention in the classes intense and searching."

Intense and searching—these characteristics of the boy of fourteen, marked also the man. The next year he quitted the gymnasium. After busying himself for another year, principally with mathematics, philosophy, and chemistry, he entered at the University, where he could count among his teachers, Müller, Dieffenbach, Schönlein, Romberg, and also Rudolf Virchow, who later became his great and true friend.

But his education was to take a wider range. As a young Doctor, scarcely nineteen years old, he set out, for the most part in the company of his early friends, first towards Prague, which then stood in the van of scientific progress. He was chiefly attracted by the clinique and by the person of Ferdinand Arlt. With him he learned to understand how much ophthalmology could do and how much it had still to accomplish. And at once his choice was determined; he would become an ophthalmic surgeon. This decision brought him, in the winter of 1848-49, to Paris, where he hoped to learn and see much in

the cliniques of Sichel and Desmarres. And in this he was not mistaken. At Sichel's he was captivated by the wealth of the material; at Desmarres by the eye and hand of the master. Sichel was delighted with his pupil; Desmarres soon learned to appreciate his worth. When, occasionally, Desmarres himself could not attend to his clinique, or, as often happened, when he could not complete it in the time at his disposal, it was his young German colleague who took his place. Everything, including operations, was entrusted to him, and that in presence of a swarm of specialists, for the most part senior to himself, who were wont to resort to the clinique from all countries.

Of French surgeons, he liked best to hear Malgaigne; of physicians, Louis; and of specialists, "the most characteristic feature of Paris," Trousseau on children's diseases; and Ricord, who especially charmed him. Later on, he almost exclusively employed himself under the direction of Claude Bernard, in the Collège de France, with experimental physiology, and especially with the intracranial section of nerves and the ocular muscles.

The winter of 1849-50 found him in Vienna, where in Friedrich von Jaeger he found his father's friend, who received him with open arms. In order to perfect himself as an oculist, he turned to the best account the cliniques, courses, laboratories, and everything else of the kind that Vienna afforded. Of von Brücke's lectures on physiology he spoke with great appreciation.

In August, 1851, at the first International Exhibition, chance threw von Graefe and myself together in London. I had already enjoyed there for some days the companionship of Friedrich von Jaeger when one morning a young man in Alpine costume rushed into Guthrie's eye hospital—he had reached London but about two hours before—and threw himself into von Jaeger's arms. With the words, "You are made for each other," the latter literally threw him into mine. And he was not mistaken. From early morning when, on our way to Moorfields Hospital, we took our modest breakfast in Oxford Street amongst the workmen going to their work, till late evening, when we gratefully quitted the hospitable home of our friend William Bowman, we remained inseparably united in common objects of pursuit. Von Graefe was my guide in practical work, of which I had as yet but little experience, and I again could impart to him much from the physiological side. This mutual instruction constituted for us a great attraction. These days in which von Graefe unfolded the whole charm of his fine nature belong to the happiest recollections of my life.

Abundantly qualified and eager for work, he returned to his native town. Though everyone here had prophesied for him a splendid future, the event surpassed his most sanguine expectations. At his own cost he established a clinique on the French system, consisting of an out-patient department, together with some beds intended chiefly for operation cases. "Since I started," he wrote to me two months later, "I have registered 230 patients." And he thought then that, within the year, these would amount to at least 1,000. After ten months there were already more than 1,900; and after eight months more, though not yet twenty-five years old, he had at his disposal thirty-six beds, and a material of eye-disease which, as he writes, "could well compare with the largest in either London or Paris; for," continues he, "if our out-patient department only amounts to 4,000 patients a year, the perfectly regular attendance of the patients, the exact observations. and the clinical experimental aim in the treatment constitute, in my opinion, points of some value." A few years later, the annual number reached the astounding figure of 10,000.

During his stay at Vienna, he began a short course on ophthalmology to some of his friends. When these asked him if he would also speak of therapeutics, he gave the following significant reply—"That we will study together in Berlin." And this time had now arrived. What course he was to strike out has been above related. If he put value on his clinique, it was on account of the absolutely regular attendance of his patients, the exact observation, and the careful experimental investigation of the results of treatment. These include everything. At first he gave special attention to the anomalies of the muscles. This inquiry was a continuation of the researches already begun in Paris, and which were, perhaps, further excited by our discussions and inquiries in London. I need not remind you how he has again brought into repute the operation for strabismus, and what he showed to be attainable by advancement and setting back of the tendons in the most varied forms of muscular contraction and paralysis. And then there appeared from his hand a classical investigation of the mode of action of certain remedies; first, of nitrate of silver; later on, of chlorine water, atropine, eserine, etc. And in diphtheritic ophthalmia, the clinical determination of which is one of his greatest services, his suggestions as to treatment are the crowning merit of the work. He followed now a more surgical method of cure than he had been able to employ with Desmarres, and he was especially studying the mode of action of iridectomy and paracentesis, the pressure-bandage, and also scarification as a means of cure. In cataract extraction, even under the most favourable

circumstances, a considerable percentage of cases was lost through suppuration. Surgeons accepted this as inevitable. Von Graefe did not rest till he had discovered the safest method, and reduced the risk to a minimum. For the obstructive *Abstine si modum nescis*, he substituted the rule of progress, "Observe and act;" and yet he was on his guard against every rash proceeding. He removed cysticercus from the vitreous, incised retinal detachments, and, even in central scotoma from myopia, sought for and arrived at operative remedies. Thus, also, he encountered glaucoma. After all attempts to cure or to avert this, the most terrible of all diseases of the eye, had failed, oculists had abandoned it in despair; but it was von Graefe alone who could not rest there. Again he began to track the evil in all its manifestations, and he became more and more convinced that the destructive effects depend upon the increased tension of the eye. Against this he now concentrated his forces. Paracentesis gives, as was already known, only transitory relief of the symptoms, and even that, as he discovered, only the first time.

Could iridectomy do anything? The idea gained strength with him. He remembered cases where ulceration and infiltration of the cornea were improved by iridectomy. After this operation, he had seen corneal and scleral staphylomata diminish. He therefore thought himself justified in trying it against glaucoma. The difficulties of execution did not frighten him. Anxiously he waited the result, and, behold! the goal was won. This was von Graefe's greatest triumph, undeniably the greatest which ophthalmology can boast in our century. May no literary strife soil this fair page in the history of our science. The truth is, as Haffmans has already recorded, that von Graefe had been anticipated more than thirty years before by Mackenzie, who, however, had not followed up the practice so as to establish it; and his track, long neglected, had remained unknown to our Graefe. To have followed the track to the goal, and to have laid it open to others, is the immortal merit of Albrecht von Graefe.

Together with the eye clinique, the school which bears von Graefe's name was opened. Even before the clinique had attained great proportions, von Graefe's fame had penetrated far and wide, and from all sides young and old flocked to see and hear the youthful master. Those who still mistrusted his renown came, saw, and were conquered.

At first von Graefe continued to give some theoretical lectures, of which Horner speaks with admiration, but soon he restricted himself to the clinique, and capable assistants were entrusted with the different courses. In addition to his eye clinique, his private practice increased. From all sides, from all countries, the sufferers swarmed to Berlin to their saviour,

as they called our hero. And this was quite explicable. As a physician, a therapeutist, von Graefe stood in the first rank. Horner has stated this, and Schweigger and many others have confirmed it: "Von Graefe accomplished more of a perfect and sterling kind than had ever been done before." He himself knew it. "In many respects (perhaps in elegant, though not in good, operating, and I recognise none other), I must yield to my colleagues; but give me a couple of wards and some patients, and a fortnight's treatment will show that I can hold my own." Thus von Graefe, in everything so modest, expressed to me his self-confidence on this point. This was the sacred goal of all his efforts, and why should he not dare to cherish within his breast his satisfaction in having obtained it.

In the year 1857, after von Graefe and some professional friends had first met together in Heidelberg, the first International Ophthalmological Congress was to be held at Brussels. In August he wrote to me: "I have no great longing for Brussels." I convinced him that he ought not to be absent, and he accordingly came. A genuine ovation awaited him there. The entire ophthalmological world was there, and every eye was turned to him. When he had finished his communication on Glaucoma in his own fresh and graphic manner, yet still so earnest and impressive, the storm of applause broke forth. And in the evening von Graefe and a few colleagues were found with lamp and ophthalmoscope at the Eye Institute at Brabant, where he demonstrated the still little known instrument, and the method of its use, to many of his colleagues from the South of Europe.

Could von Graefe go on satisfying the ever-increasing claims upon him? Already, in 1853, he had written to me how one morning in August, wearied in body and still more in mind, handing over both clinique and private practice to his assistants, he had gone away secretly to seek for restoration where he had always found it before—among the beautiful Alps—and how he, already in a few weeks a different man, had felt "what a load of cares weighed upon his young soul, and threatened the balance of his mind." And each succeeding year that exhaustion returned. And every year, after spending some days here in Heidelberg, his longing drove him to the Alps. Once—it was in the year 1859—Arlt and I were able to accompany him there,—days never to be forgotten. On the beautiful high peaks he was just as sure a guide as in the field of ophthalmology, and the charm of his character was at its height.

But his restoration each year was incomplete. As early as 1856, he speaks of an illness, and of a heavy oppressive period

following upon it. To set him up again, he needed nothing else than another cure of glaucoma, which had indeed made him happy, and another visit from Arlt, who had "rejoiced like a child at its happy results." But still worse was to follow. In the year 1861 Switzerland was not his most cherished aim. A fortunate star smiled on him from the north. In a few weeks he was to be united to the lovely and gifted Countess Anna Knuth, whose charms had won his heart. One more meeting with his friends in Heidelberg, and he would be off to Roeskilde for the realisation of his best hopes. But no! there was awaiting us in Heidelberg the crushing news that von Graefe was detained by sickness in Baden-Baden. At his request the usual scientific meetings were held; then we hastened to Baden-Baden to learn more particulars. Three days previously, von Graefe, percussing himself, had discovered an extensive pleuritic effusion, which had developed gradually without febrile symptoms; and his friend, Traube, summoned from Berlin, had confirmed the diagnosis. I found him lying peacefully on his bed, in quiet submission, and with comparatively little difficulty in breathing. "My poor friend," said I, pressing his hand. "Yes, poor friend," repeated he, and added, "It took me a full hour to give up all my illusions. But now I am all right again. Tell me about Heidelberg.' And when I had talked of this for an entire hour, his longing was still unsatisfied; he took up Goethe, which lay by his side, and pointed out to me the words, the deep meaning of which had so often struck us as we read them on Jaeger's test-types, "One cannot too early realise how superfluous one is in the world." At the outset sufficiently serious, his illness assumed in October and November a very ominous character. "I, myself," wrote von Graefe, "merely wavered between the prospect of succumbing and of becoming permanently an invalid." And his physicians were of the same opinion, though rather inclining towards the worst. At last, in December, his condition assumed a more cheerful aspect; and at the commencement of February, after five months' terrible confinement, he was able to quit Baden-Baden as convalescent, in order to seek at the Mediterranean the fresh air for which he had earnestly longed; and he inhaled it in full draughts and with splendid results. "You can scarcely form an idea," so he wrote me from Nice, "how splendidly invigorating the air is here. I took my first walk with the greatest apprehension; my limbs and lungs seemed to fail me. For the first quarter of an hour I crept along only with great effort; then it got easier and easier, so that at last I reached home actually stronger than when I started." On April 15th he left Nice to return by way of Paris to Berlin, where, on June 6th, his long-deferred marriage took place.

We now enter on the second period of von Graefe's active life, which is separated from the first by his illness and his marriage. I shall occupy but a short time with it. Was this second period, which began with von Graefe's 34th year, and was to last but eight years, very unlike to the first?

He entered upon it with the firm resolve of limiting very much the sphere of his activity in Berlin, especially in his lectures and hospital work during the first summer session, and of attending the clinique only twice a week. But soon his life returned to the old grooves; external circumstances and inward impulse prevailed over the best resolutions. His young wife behaved very bravely. He could devote but a few hours to her: she was content with them. He cared little for comfort, nor did she. He did not tie himself to time, a disturbing element in every house, but not in theirs. She lived by and for him, always subordinating her wishes to his. On his journeys he took—yea, dragged—her everywhere with him. She, proud and happy to belong to him, wished for nothing better. But what a love was his, too. I have never observed her make a serious attempt at any real change in his mode of life. Sometimes he was heard to complain when the pressure of work became too great; but he never shirked it. With all the disinterestedness of his nature, the homage offered to the surgeon therapeutist still did him good. Be this as it may, patients were to him a daily necessity. When they were wanting, he felt a void which perhaps only the Alps could fill. Even at Nice, when scarcely convalescent, he saw patients daily for a few hours before sauntering about in the fresh air.

Some sunny years still awaited von Graefe. In quick succession, his wife presented him with three children; and his spacious handsome house in the Bellevue Strasse, in which he brought together every comfort for his family, gave him great gratification—more, indeed, than I had anticipated.

As his guest—it was permitted to me to be the first—I was not only a witness of his domestic happiness, but I also saw him by the side of his amiable and hospitable wife in a select circle of friends, beaming with joy and felicity. But too soon came an end to so much that was bright and beautiful. The loss of one of his beloved children deeply affected him. More than once he wrote to me about it in most pathetic terms; nor could he any longer conceal from himself the approaches of the dreaded consequences of his late illness. In the meantime, little of this was externally visible, and he fulfilled his duties as before, with unwearied devotion. Regularly every day, for hours together, he visited his out-patient room, with its unwholesome atmosphere, and he delivered his clinical lectures with the same ardour and under the same stormy applause as heretofore. He also continued to record

regularly in the "Archives" the fruits of his investigations and experience, which he for the most part prepared in the holidays, dictating them in his well-known expressive style. In this second period, he treated still further of tuberculosis of the choroid, and referred again to intraocular tumours; he examined the calabar bean, the compress bandage, and hypodermic injections as means of cure. And in this period fell almost entirely the invention of his modified linear extraction. More than once he recurred to muscular anomalies—the operation for strabismus and muscular asthenopia—and wrote in addition two masterly treatises on glaucoma, the first as the earliest work of this second period, the second as his death-song only a few months before his end.

From 1857, his letters, with all their charms and interest, breathe more and more some heaviness of mind. One can feel the reason of it; yet he still continued his work as if there were to be no end to it. The clinique did not fall off, for here the need was ever greater than the opportunity of satisfying it. Also his voice, though somewhat less resonant, was still heard in the lecture-theatre with the old applause. And he was still at the service of everyone who required his help, with the same willingness as in the first days of his practice Nevertheless, he took refuge, at the entreaties of his medical friends—especially in the last two years, when his chest-symptoms became almost insupportable—at Inselbad, by Paderborn.

I will not relate what grief I saw there in the summer of 1869, when he, with his own little promising case, saw the life of his wife threatened by an embolic pneumonia, which broke her health for ever, and his youngest born fatally stricken with a rapidly increasing malady. And yet, on his return home, he began anew the old work with the old courage, and as much strength as was left to him.

The end came in 1870. On May 23rd, he wrote: "My state of health continues to be wretched. Fever I have none, it is true, but I am excessively exhausted. I spend about twelve hours a day out of bed, of which four are devoted to clinical pursuits. I have also begun my lectures, perhaps more for my own entertainment than for that of my auditory. That, as a rational man and a physician, I can cherish for myself no great hopes, is self-evident; but occupation up to the last moment appears to me the best, and holds me back from useless questionings." His last letter, still written with his own pen, some days before his death, is about a consultation, and is a pattern in style, a masterpiece in precision. The conclusion is heartrending: "My health grows worse and worse, but enough of that to-day. I look upon each day as my last, and I am especially concerned at the grief of my wife. In inseparable friendship, thine old friend, Graefe.

At last the hour was come. On July 19th, 1870, after a charming summer's evening, he was to pass the night in his garden-saloon. A couch was put up for him. Scarcely had he lain down, when he felt the death anguish. Everything possible was done. "Agony," said he, "nothing to be done." Slowly the night hours wore away. Once more he longed to see the gleam of breaking day. Then he passed away gently.

Albrecht von Graefe leaves with us the impression of a man to whom a mission had been entrusted, and who left us after fulfilling it. Sixteen years have gone by since his death, and his successors have followed in his footsteps; and thus tens, and even hundreds, of years may pass, and thousands may still come to follow in the same track. For men with a mission to fulfil but rarely make their appearance in any particular department. Von Graefe has been regarded by some as one born under a propitious star; the value of his services having been attributed to the fortunate relation in which they stood to the invention of the ophthalmoscope. Those who so judge run the risk of overlooking his true greatness. The ophthalmoscope has raised the level of ophthalmology; but it has raised to the same level the achievements, the merits of all its representatives. Each glance into the eye with the ophthalmoscope was a revelation; but every observer made his discoveries at his own time. The most competent observer, who gave the most correct atlas, carried off the palm. But, even in this, von Graefe has his special merit: in the discovery of the cysticercus; in the diagnosis of embolism of the arteria centralis; and in the optic neuritis consequent on intracranial pressure. But his chief services—the teaching of anomalies of the muscles; diphtheritic ophthalmia; the improvement of the method of cataract extraction; not omitting the cure of glaucoma—lie outside the sphere of the ophthalmoscope. Without the ophthalmoscope, he would have surpassed his contemporaries still more than with it.

Love and trust so great, with such grand talents, must, at any period and at any point of our knowledge, have brought about great results and worked wonders.

[In passages of much interest which he has omitted in the translation of his address into English, Professor Donders speaks with enthusiasm of von Graefe's warm and sympathetic nature. He tells us how an ardent desire to relieve suffering, and to give help to those whom his skill could reach, was ever uppermost in his mind, even among the absorbing interests of scientific study and the arduous duties of a teacher; and how, though weary and exhausted by his labours, he visited his

patients late in the evening, and often after midnight, when he thought that his help might avert some threatening danger. He describes von Graefe in his consulting room, surrounded by his assistants, controlling, directing, observing every case himself; always bent upon solving some undetermined question; acquiring knowledge, and applying it to his one constant purpose of helping and healing; and doing all without respect of persons. An exalted personage, who had sent for von Graefe, found that he must come himself to the consulting room of the busy oculist; when there, moreover, he was kept some time waiting. "They say one should come to you in a blouse," said he, when at last admitted. "I beg your pardon, it makes no difference whatever," replied von Graefe, smiling, and proceeding to examine and cure the eyes of his Highness as those of an ordinary mortal.]

I turn now from our dear departed friend to Hermann von Helmholtz, whom we have the happiness of seeing amongst us in the full vigour of his manhood. It would be superfluous for me to enter fully into a description of his merits or to sound his praises before you. Everyone knows that of living natural philosophers none surpass, and but few equal him, and that he has taken a permanent place among the great men of all time. Two years older than he, I have followed from the beginning all that he has achieved. His contributions to science when a young army surgeon in Potsdam garrison, where his mathematical talent was already conspicuous, at once attracted the attention of physiologists. They proved how strongly he was inclined to devote his powers to the solution of problems, either entirely new or already abandoned as incapable of solution; a bold critical task, but all the more glorious if accomplished. I may remind you of his enquiries on the nature of putrefaction and fermentation, on the waste of tissue, as well as on the development of heat in muscular action, of his measurement of the waves of muscular contraction, and of his determination of the velocity of nervous impulses produced by stimulation. In the meanwhile he wrote the article "Heat" in the "Encyclopœdic Dictionary of the Medical Sciences," followed by the "Report on the Theory of the Physiological Phenomena of Heat." Both already foreshadowed the fruitful principle of the conservation of energy, which, independently of Julius Robert Mayer, he was soon afterwards to develop in a vigorous form, accurately describing all the facts relating to it; the power of that theory to explain the origin of light and heat in the first development of the solar system (according to the theory of Kant and Laplace) he fully demonstrated and confirmed by calculation. In the same way a practised eye could already discover in his reports on "Theoretic Acoustics"

and on "Physical Optics," just as in his first researches in the latter field, the germ of the great things which he was afterwards to unfold to our view.

When von Helmholtz turned his official activity from the field of physiology to that of physics, we understood, respected, and even heartily welcomed the change; for after having in the field of physiology shed light on nearly every question of a physical kind, we should have regretted to see him entering the field of microscopy, of physiological chemistry, or of experimental physiology, where time and diligence are the great factors, and where talents such as his could not attain their proper proportions.

And in the field of mathematical physics, in that of pure mathematics, and on the border line where philosophy and mathematics meet, he continues with undiminished powers to astonish the world by his contributions—contributions of which the special importance is implied in this, that they are appreciable by the intelligent public, without any special knowledge, and admit of popular demonstration, as von Helmholtz himself has fully proved.

But what has caused us, ophthalmologists, to indicate the great natural philosopher as the man to whom, among all now living men, ophthalmology is most indebted? You know the reason. Von Helmholtz has a double claim to this distinction; first for the greatest work of scientific research, and, second, for the most fruitful invention.

This greatest work is his "Manual of Physiological Optics," with which, in this field of intellectual labour, only one other can compare, one of less ample range, but just as profound, and, perhaps, as inspired, the "Science of Musical Sensations." But, in the author of that work, von Helmholtz has, as you know, no rival to fear.

In the composition of his "Physiological Optics," von Helmholtz imposed upon himself the colossal task of testing every important statement by his own observation and researches; and this task he has fulfilled to the letter. A glance into his laboratory will show how, beginning with acute questioning, then controlling and experimenting, he makes everything clear to himself, and writes it all down in a clear, broad style, in order now to examine more closely what has been contributed by others towards the attainment of these results, and to record their names and researches, careless whether, in doing so, he clothes them with a share of his own proper merit.

Only the man strong in the consciousness of gigantic powers can be so independent, so negligent of his own deserts. And if we open the "Manual," now some thirty years after its first appearance, we are, even at the present stage of science, astonished at the correctness of the insight and of the state-

ments, so that we might almost be tempted to believe in his infallibility. This greatest work, next to the "Anatomy of the Eye," is the foundation of our knowledge of the pathological processes and the key to our explanation of the symptoms. And this is his first claim to our distinction; his second claim, the most fruitful discovery.

The year 1851 will always be marked with golden letters in the annals of ophthalmology, as that of the discovery of the seat of the accommodative power, and as the year of the invention of the ophthalmoscope. If it be a satisfaction to me to venture to claim the first for my countryman, Dr. A. Cramer, I must not here omit to state that von Helmholtz shortly afterwards arrived independently at the same result. With a noble modesty, for which I thank him, he declared himself convinced, after an examination of the treatises sent to him, that the enigma of accommodation, upon which so many enquirers had in vain exhausted their ingenuity, was in reality solved as to the main points, and that little more remained for him to do in the researches he still contemplated. But as concerns the invention of the ophthalmoscope, that belongs to von Helmholtz, and to von Helmholtz alone. Further, we see him define the conditions under which the eye can be illuminated—conditions which were not as yet distinctly determined. And he soon discovers that it must be possible to see the fundus of the eye by reflected light. From this moment dates the invention of the ophthalmoscope. It had merely to be constructed—a thing easy enough for von Helmholtz. And even this construction displays the accomplished physicist. Later alterations may facilitate its use, and the employment of the inverted image may have its incontestable advantages, but, in truth, the instrument in its original form is optically more complete than any other, and was so considered by that finest of all observers, Edward von Jaeger, and made use of for his wonderful drawings and exact determinations of refraction.

How the ophthalmoscope could be serviceable to ophthalmologists, how the eye under examination, whilst its fundus becomes visible, constitutes for the emmetropic examiner a lens (a Stanhope lens), too weak in myopia, in hypermetropia too strong; and how, simultaneously with the examination of the fundus, the refraction can be determined; all this was clearly indicated by von Helmholtz. But he never thought, or at least he never said, that the new instrument implied the dawning of a new era for ophthalmology. Von Graefe felt it immediately. When he, for the first time, saw the background of the eye, with its nerve-entrance and its blood-vessels, his cheeks reddened, and he called out excitedly, "Helmholtz has unfolded to us a new world!" and then, "What remains there to be discovered?" added he, thoughtfully. It was, indeed,

humiliating to hear it said, banteringly, that black cataract was that disease in which the patient saw nothing, nor the surgeon either. Treatment was then but a groping in the dark. Under the same name were thrown together the most diverse affections of the fundus oculi and of the nerve apparatus; and even disturbances of refraction and accommodation, such as astigmatism and muscular asthenopia, were reckoned with amblyopia. And against these most diverse disturbances the same empirical remedies were employed—many of them a real torment to the patient—not only with little beneficial result, but sometimes at the cost of health.

In 1858, von Helmholtz exchanged Bonn for Heidelberg, where he hoped soon to see his desire for a laboratory gratified. Here we had special pleasure in welcoming him on the occasion of the meeting of our Society. At our invitation, he was to join us at our meetings, and honour our festive board with his presence. The thought occurred to von Graefe of testifying our respect and gratitude by the presentation of a small gift. A silver goblet was soon found, and the names of the members present engraved upon it. At von Helmholtz's side, von Graefe arose, and described in animated language how the invention of the ophthalmoscope, which adorned the name of von Helmholtz with the laurel of immortality, elevated and rendered happy the ophthalmologist. "Under our eyes," this was the tenour of his speech, "we see the mists disperse, which for hundreds of years have clouded the view of our best observers, and an unexampled field is won for the healing art, from which even already, after a few brief years, have been reaped most admirable fruits." And, turning to von Helmholtz, he handed him, in the names of all of us, the goblet, with the words of the inscription, "To the creator of a new science, to the benefactor of mankind, in thankful remembrance of the invention of the ophthalmoscope." Von Helmholtz was visibly moved by this unaffected proof of our gratitude. It was, as he said, the first public acknowledgment of his merits. In his own home, beloved lips said, "Better than a decoration." And von Helmholtz replied, "Certainly! it is a decoration on the part of competent judges."

And now, twenty-eight years after that memorable day, highly-esteemed and honoured von Helmholtz, I turn to you in the name of that society for which von Graefe then spoke, and, so to say, in his name, the name of our Master and Patron, offer you the first honorary medal instituted in his memory. May this gift hereafter—when, following the first modest tribute which our society long since ventured to offer you, Science in her highest embodiments, and your Emperor, whom you reverence and esteem, shall have heaped upon you all the distinctions suitable to great endowments associated

with great deserts—may this gift still remain to you a gratifying symbol of the privilege you enjoy of living in a generation that honours you as its benefactor.

May this happy knowledge, which is not granted to every man of genius, illumine with its gentle light the evening of your life, in which may you see yourself always surrounded in unfading freshness of mind and body by the love of all that are dear to you.

Professor von Helmholtz replied in the following terms :— Gentlemen —You have, by the exceptional honour which you have conferred upon me, called for an expression of gratitude to which I hardly know how to give utterance. When, a year ago, I was made acquainted with your determination to select me as the first recipient of the medal which has been dedicated to our ever-memorable Master, I was agreeably surprised, but, at the same time, placed in a difficulty. Agreeably surprised, naturally, that after the rapid flight of fifteen years, which I have had to devote to other studies, you still so vividly remember the assistance that I was once able to render to ophthalmology ; and the more joyfully so, since, in the meantime, what I have contributed has, through the wonderfully rapid development of ophthalmology, been subjected to the most numerous and searching tests, and has been in a measure modified and superseded by newer inventions and investigations.

And now my difficulty begins. When I myself calmly review the real history of my ophthalmological discoveries, I cannot help saying to myself : – Some of them were due to good fortune, and the rest was but the work of a well-instructed workman, who had learned rightly to employ the ready-made means and knowledge of his predecessors. I have previously —at the first festival in memory of von Graefe, when we unveiled his statue at Berlin—expressed the same thoughts before you. The "ophthalmoscope," I said, "was a discovery rather than an invention ;" that is to say, when a well-trained physicist came and once grasped the importance of such an instrument, nothing more was wanted, since all the knowledge had been developed which was required for its construction. As regards the good fortune, it has so far favoured me by forcing me into a position which I did not at the time regard as good fortune at all. My inclination and my interest were from early youth directed towards physics. My father, a teacher in the gymnasium, living in very straitened circumstances, but a man who had strikingly exemplified in his life the lofty scientific enthusiasm of Fichte's philosophy, and of the war of liberation, explained to me, sorry as he was to do it, that physics did not constitute a science by which a livelihood

could be obtained—and, indeed, at that time this was so —but that, if I would study medicine, I might combine with it the natural sciences. Well, as a man of these days, who has no leisure to grieve over lost opportunities, but must try and make the best of any situation—and has moreover learned to wait—I accepted the situation as it was, and in the meanwhile studied medicine. But this ultimately proved an advantage. Apart from the fact that I thus attained to a much wider knowledge of the science of nature than would usually have been the lot of students of physics and mathematics, and independently of the favourable circumstances which that period afforded to a young medical man trained in physical science, I have by this study become, in my later opthalmological work, deeply sensible how vast an amount of useless science, as well as of printer's ink, has been wasted on the theory of accommodation, and what an abyss of ignorance has been comprised under the name of "black cataract,"—an abyss which, indeed, proved by subsequent illumination to have been far deeper than could have been at that time imagined.

The ophthalmoscope has unfolded itself to me simply out of the necessity of discussing, in my lectures on physiology, the theory of emission of light by the eye. Why does the human eye not glisten under ordinary circumstances, since in its background there is situated a spot—small, indeed, but clear white; that is to say, the end of the optic nerve, which must reflect light in the same way as the most sparkling tapetum of animals' eyes? Why do animals' eyes sometimes shine with such remarkable lustre, though they may only be illuminated by a small distant flame? These questions, when once proposed, were not difficult to answer, and now the answer is known to everybody. Once answered, they furnished the means of lighting up the eye of another human being, and of seeing it plainly.

Ophthalmometry, on the other hand, developed itself out of the question of the theory of accommodation, of which numberless views have been expressed, most of which were very easy of refutation, while none admitted of proof. Having read that the weak reflections of light from the lens, the so-called images of Sanson, had been seen by others, I myself sought them. As soon as I for the first time undoubtedly did see them and had found them even less feeble than I had expected, I became conscious that the process of accommodation could be cleared up in all its details. Meanwhile, Cramer, under Donders's guidance, had anticipated me; he had already fully recognised the alteration in the anterior surface of the lens. The determination of the very minute changes of the posterior lens surface required more exact observations, and these led to the system of ophthalmometry which I have worked out. Only after the

alterations of shape of the lens had been established from every point of view could a proper theory of the mechanism of accommodation be given.

Another side of ophthalmology to which my attention had been already directed by the doctrine of J. Müller concerning the specific sense energies, was the theory of colours. Not being inclined to speak in my lectures of things that I had not myself seen, I made experiments in which I blended together the spectral colours in pairs. To my astonishment, I found that yellow and blue gave, not green, as had up till then been generally asserted, but white. Yellow and blue pigments, when mixed, give green, and, till then, the mixing of these coloured materials was regarded as corresponding with that of the spectral colours; that produced at once an important change in all the previously accepted laws of colour admixture, but it comprised something still more important. Two master minds of the first rank, Goethe and David Brewster, were of opinion that the yellow and the blue could be distinctly seen in green. They had seen the result of the gradual mixture of the two colours with the brush, and they believed that they were able to divide their perception of the resulting colour into two parts, neither of which, in reality, was there at all. This was one of the circumstances which first drew me over to the empirical theory of perceptions. It indicates even now the contrast between my position in the theory of colour-perception and that of Hering and his adherents, who hold firmly by the opinion that from the perception one can directly read off its several component parts.

This series of investigations led me at last to the determination to work afresh through the entire subject of physiological optics, which work I have recorded in the manual which I have published. Looking back over this series of investigations, I cannot see, speaking quite candidly, that in this department (I will not speak of others) I have been more, even at the best and under the most charitable view, than an attentive, diligent, and well-trained worker, who has done—shall we say "well?"—what he had learned to do, and just what a person can be taught to do. Now to such, do not the claims of others stand in contrast who have accomplished something further, namely, done for themselves what one cannot be taught to do?

This question reminds me of certain considerations as to the different characters which scientific activity exhibits in the various branches of science. If we confine ourselves here to those branches devoted to the observation and regulation of the material world, we find the one extreme most accurately represented in theoretical physics. Here we find matter regulated by exactly defined, undeviating laws, whose consequences can be worked out with the utmost accuracy of mathematical

thought. So far as our knowledge extends will the origin and relation of things be freed from all darkness and all mysticisms. The forces of Nature, thus subdued, not only submit themselves theoretically to the knowledge of man, but are also the ministers of his will. Consequently, new conquests in this direction require, for the most part, the highest stretch of the human intellect, of which but few individuals are capable. But whatever of such knowledge has once been conquered, and stereotyped in the exact and clearly understood form of science, can be certainly and completely transferred to future generations. But the area which can be subjected to the unconditional command of perfect knowledge is, unfortunately, very limited; and, indeed, the organic world for the most part lies without it. But in numberless cases we are obliged to act, though we have no clear idea of the relative bearings of things—in politics, in war, every act of intercourse of men, and also in medicine. Here is prominently displayed another phase of intellectual endowment, whose purest form we see embodied in the artist. Rich experience gives a knowledge of the typical course of phenomena, which he who possesses it cannot describe in words; and lo, when he is called on for action, he is found competent for it, though unable to state the precise reason for his action. I have always regarded great physicians as artists in this sense, and the mode in which they sought to transmit their knowledge to others as a sort of allegorical representation, which is treated unjustly if we regard it as a physiological theory, and apply to it a standard of that kind. The gifted physicist sees in these departments only the easily recognisable defects of such quasi-theories; he practices unsafely and unsuccessfully; he feels himself discontented and unhappy, and is therefore without moral influence on the patients and their friends; in short, he recognises here the limit of his powers.

Now permit me to convey my conclusions also in an allegorical form, so that I may not wound any personal susceptibilities. Let us suppose that up to the time of Phidias nobody has had a chisel sufficiently hard to work in marble with perfect control of the form. At least they could mould clay or carve wood. But now a clever smith discovers how a chisel can be tempered. Phidias rejoices over the improved tools, fashions with them his god-like statues, and controls the marble as none have done before. He is honoured and rewarded. But great geniuses are most modest just in that in which they most excel others That very thing is so easy for them, that they can hardly understand why others also cannot do it. But there is always associated with high endowments a correspondingly great sensitiveness for the defects of one's own work. Thus, says Phidias to the smith, "Without your aid I could have done nothing of that. The honour and glory belong

to you." But the smith can only answer him, "But I could not have done it even with my chisels, whereas you, without my chisels, could at least have moulded your wonderful works in clay; therefore I must decline the honour and glory, if I will remain an honourable man."

But now Phidias is taken away, and there remain his friends and pupils, Praxiteles, Paionios, and others. They all use the chisel of the smith. The world is filled with their works and their fame. They determine to honour the memory of the deceased with a garland which he shall receive who has done the most for the art and in the art of statuary. The beloved Master has often praised the smith as the author of their great success, and they finally decide to award the garland to him. "Well," answers the smith, "I consent. You are many, and among you are clever people. I am but a single man. You assert that I singly have been of service to many of you, and that many places teem with sculptors who decked the temples with divine statues, which, without the tools that I have given you, would have been very imperfectly fashioned. I must believe you, as I have never chiselled marble, and I accept thankfully what you award to me. But I myself should have given my vote to Praxiteles or Paionios."

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MARCH 10TH, 1887.

J. W. HULKE, F.R.S., President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

The President announced that Mr. James Dixon, Consulting Surgeon to the Royal Ophthalmic Hospital, Moorfields, had presented a complete series of "von Graefe's Archives" from the beginning up to the year 1875.

Ophthalmoplegia Externa.—Dr. C. E. Beevor.—Case of ophthalmoplegia externa without other symptoms. The patient, a woman, aged 40, had rheumatic fever six years ago, after which the right eye suddenly turned outwards; it was doubtful whether the left was affected. Up-and-down movements weak; almost complete paralysis of lateral movements;

considerable degree of ptosis; pupils equal, and react to light and accommodation; convergence lost; optic discs normal. Some improvement had followed treatment with iodide of potassium.

Pupillary Contraction in Lateral Movements.—Mr. Marcus Gunn.—The patient, a boy, aged 10, had a blow on the left eye with a cricket ball two years ago. Now, in this eye, lental opacity, and no fundus reflex; bare perception of light; projection extremely defective, being accurate only outwards. On fixing a distant object with the right eye for some seconds, nystagmus commences in the left only, slight in degree, and lateral. On looking strongly to the left, both eyes exhibit nystagmic movements. On lateral movement to the left, both pupils contract; they do not change on lateral movement to the right, nor in association with any other muscular movement except convergence, when they act normally. Both pupils react well to light, but the left, alone, contracts feebly through defect of vision. The downward movement of the left eye is somewhat impaired, and on looking upwards the left is strongly divergent.

Picture Painted after Extraction of Cataract.—Mr. Brudenell Carter showed the picture. The artist, aged about 55, was operated upon for mature senile cataract of the left eye in November, 1885. The right lens was at that time partially opaque, and became completely so by the end of 1885. The picture was painted in October, 1886, with the left eye only. It showed absence of astigmatism; the correcting lens was spherical only.

Fibroid Degeneration of the Ciliary Muscle.—Mr. Karop showed microscopic specimens.

Dr. Brailey was not satisfied that there was fibrous degeneration; it might be that the muscle had been stretched and extended in mounting; there was, however, an abnormal layer of nuclei.

Paralysis of External Recti.—Mr. J. G. Mackinlay.—Patient, a girl, aged 16. No diplopia. No other muscles affected. The pupils react well to light. Acuity of vision greater in left eye. Astigmatism of both eyes. Partial deafness on both sides. Conditions probably congenital.

New Vessels in Vitreous Body.—Dr. Ernest Clarke showed a case.

Vitreous Hæmorrhage.—Mr. Brudenell Carter.—A young man in whom a large spontaneous vitreous hæmorrhage had been almost completely absorbed.

Mr. Higgens.—A boy, aged 7, with hæmorrhage in the vitreous body, and peculiar deposit behind the retina (? inflammatory).

Associated Movement of Upper Lid and Eyeball.—Dr. Sidney Phillips.—Two cases. The patients were brothers; the condition was seen in one at the age of six months. The eyes being directed to either side the upper eyelid of the opposite side drooped.

New Formation in Vitreous.—Mr. Rockliffe related two cases. In the first there was high myopia, in the second a history of a blow. Also a case of ossification of the choroid, causing sympathetic ophthalmia. No history of syphilis or injury; an attack of kerato-iritis eight years previously. An extensive layer of bony tissue was found in the choroid extending in all directions from the site of the disc; the lens, which was entirely absorbed, was encapsuled in a bony shell.

The President observed that the first two cases were clearly instances of inflammation and not new growth. Bone formation probably occurred in inflammatory products, not in the choroid.

Tubercular (?) Disease of Choroid: Extirpation of Both Eyes.—Dr. Brailey and M. Hartley.—Five years previously the patient's left eye was struck with a piece of metal. No notice was taken of the accident, but in June, 1886, the eye was tender, and he applied for relief. A small triangular piece of metal was then discovered resting upon the iris at its lower part. Faint horizontal streaks of opacity were visible in the lower half of lens. The metal, with the iris to which it was adherent, was removed by a downward iridectomy, and the eye seemed to become quiet. In about a month the patient returned, complaining of intense pain in the left side of his head, with diminution of sight in his right eye, which before was normal. Then R.E.V. $= \frac{20}{70}$; cornea bright, but surrounded by zone of injection. No pain or photophobia in

this eye. L.E. Intense vascular injection. Cornea uniformly opaque; tendency to bulging of iris at the upper and lower ciliary margins. V.=0. T.+2. This eye got rapidly worse, and was extirpated. The right eye was treated with biniodide of mercury, leeches, atropine, &c.; but on August 4th there was pain in this eye and right side of the head; much chemosis, V.=barely fingers. August 21st, marked prominence of ciliary region, cornea slightly hazy from altered T.?, eyeball large and prominent; iris swollen and pupil obliterated; T.+. V.=0. Pain and swelling continued. Eye eventually extirpated.

Examination of eye by Dr. Brailey: Globe slightly enlarged, especially in antero-posterior diameter. Cornea small, probably opaque and flat when fresh. Extensive and prominent bulging of ciliary region, especially above and below. Anterior chamber probably wanting or shallow when fresh. Optic nerve larger than normal. In antero-posterior vertical section through cornea and yellow spot: Lens in situ. Vitreous gathered up so as to occupy only the anterior half of its cavity, a thin fluid filling remaining space. Retina in situ, but thickened and much wrinkled. Choroid in situ, but much changed in appearance, at and near the posterior pole much thickened; this thickening closely surrounded the optic disc; it tapered off forward to the ora serrata, but even there it measured two or three times its normal thickness; great thickening began again at the ciliary body, and extended thence to the iris, diminishing towards its pupillary margin, which hardly appeared implicated. In the iris the new growth appeared mainly posterior to the uveal pigment layer, which appeared scarcely altered. In the ciliary body the uveal pigment was scattered, and the new growth appeared both internal and external to it. The sclero-corneal tissue was abruptly thinned at the anterior termination of the ciliary body, and enormously stretched. This change extended over an antero-posterior space of at least five millimetres. The vastly thickened base of the iris was pushed close into the projecting part. Thus was constituted the ciliary bulging. A thin, pretty uniform layer of new formation and slight consistency was found between the retina and its pigment epithelium layer, and appeared to be due to the coagulation of a fluid effused in this position. The growth did not seem to have extended

either into the substance of the sclerotic or into the retina, or to have perforated the lamina vitrea of the choroid. It was fairly consistent and non-pigmented.

The President thought the evidence of tubercle was indistinct, there was no history of it, and it was not proved by the microscope.

Dr. Brailey said that the growth in the second eye was clearly tubercular; there were well-marked giant cells and broken-down matter; no bacilli were found, but he laid no stress on that, as it might have been due to the Müller's fluid.

Mr. Lawford said that Müller's fluid did not interfere with the detection of the bacilli.

Dr. Sharkey considered the anatomical peculiarities of tubercle much more characteristic than the bacilli; even in cases of general tuberculosis, he had failed to find them in any of the organs. The earlier the tubercles the less the chance of finding them.

Mr. Nettleship thought that apart from the histology, a peracute destructive sympathetic inflammation would satisfy all the conditions found.

Mr. Hartley, in reply, said that there was nothing in the accident or in the behaviour of the first eye in favour of sympathetic inflammation.

On the Closure of Sclerotic Wounds by Suturing the Conjunctiva only.—Mr. Simeon Snell said that for a long time he had been convinced that it was unnecessary and undesirable to suture the sclerotic directly for wounds of that tunic. Perfect apposition was obtained by suturing the conjunctiva only; a needle threaded with carbolised catgut or silk was passed well underneath the conjunctiva on either side of the scleral wound, and the grip thus obtained allowed, on tying the suture, the lips of the wound to fall into perfect apposition. The resulting union was perfect. He referred to his article in the "Ophthalmic Review" for 1884, where he related cases and advocated this method; more recent experience had confirmed his opinion as to its value. He had employed it in a large number of cases where he had incised the sclerotic to remove or search for foreign bodies with the electro-magnet, as well as in several cases of accidental wounds, examples of which he related. The method advocated avoided passing a suture through the sclerotic, choroid, and retina, and left no loop in the interior

of the eye; it made the deep wound into a subconjunctival one; it did not disturb union by removing sutures; the insertion of needles in the sclerotic often increased the loss of vitreous; this was avoided.

Case of sudden and lasting Lateral Nystagmus, most marked when looking to the left.—Mr. Jessop, a man aged seventy, came to the Central London Ophthalmic Hospital on November 12th, 1886. Three days previously, he noticed, on waking up, that fixed objects moved and rocked laterally. His previous general health had been good, but he had been troubled with slight diplopia for fifty years, which he attributed to his ansiometropia. For the last week had been giddy, but had never fallen down. No syphilitic history or signs. Fourteen years deaf with his right ear, and five years with left. Eyes: no apparent squint, and fields for diplopia showed the images very little distance apart. Lateral nystagmus most marked when patient looked to the left, scarcely seen when looking to the right. Pupils equal, act to light and accommodation. Hippus irregular as to time and degree, not synchronous with respiration, pulse, or nystagmus, and not altered by looking to the right or left. He said that, on looking to the left, objects passed to the left, but he did not see them come back again. The nystagmic movements were not increased by pressure on the ear, as in Dr. Hughlings Jackson's case in the *Transactions of the Ophthalmological Society*, vol. iii, p. 261. The nystagmus was increased by active movement, especially coming down stairs turning to the right. Knee-jerks normal; heart loud, mitral systolic murmur. Urine normal. Mr. Cumberbatch had examined the ears, and said that the deafness was the ordinary deafness connected with chronic middle ear catarrh.

Conjugate Palsy of the Ocular Muscles and Nystagmus.—Dr. Gowers first drew attention to the forms of conjugate palsy of the lateral movements of the eyes caused by disease on one side of the pons. The lateral movement was excited by the sixth nucleus on one side acting through its own nerve on the external rectus, and through the posterior longitudinal fibres (and cells and fibres of the opposite third nucleus and nerve) on the opposite internal rectus. It was probable that these third nerve-fibres did not actually arise from the sixth

nucleus, but that their cells were connected with those of the sixth. It had been sometimes assumed that the centre for this lateral movement was the sixth nucleus, but this view was erroneous; the centre was possibly the superior olivary body, which, according to Betcherew, was connected with the sixth nucleus, the auditory nucleus, the cerebellum, and the spinal cord. There were three classes of palsy from disease of this region: (1) Paralysis of the sixth nerve only, from disease of its fibres within the pons, causing absolute palsy of the external rectus and deviation of the eye inwards. (2) Disease of the nucleus of the sixth, causing the total palsy just mentioned, with, in addition, loss of the associated action of the opposite internal rectus, so that this eye could not be moved inwards beyond the middle line, except in some instances, in convergence, or alone; the facial nerve was also involved in these cases. (An instance of this form was described.) (3) Disease above the sixth nucleus causing palsy of the lateral movement of both eyes, but without the total palsy of the external rectus, and consequent deviation of the eye inwards present in the first two forms. If the eyes were moved towards the opposite side, they could be brought back as far as the middle line, but not further. Thus the affected muscles could bring the eyes back from the position produced by the action of their antagonists, although they could not effect a primary movement. Hence, this return movement must be excited in some other way than through the path by which the same muscles caused a primary lateral movement. The excitation for the return movement was probably due to the influence of the centres of the opposite side. Thus, in disease of the right side of the pons, in which the eyes could not be moved to the right, if they moved to the left, the centres on the left side excite the corresponding centres on the right side to bring the eyes back to the middle line; to move them further, the interrupted right path was necessary. It was, perhaps, a special instance of the associated action of opponent muscles, continuing longer in the centres for the opponents than in those for the primary movement. This consideration simplifies the problem of the immediate mechanism of nystagmus, reducing it to the causation of the intermissions of the primary contraction. Given intermitting contraction, and the return movement, the oscillation, necessarily followed. It was probable that a tendency to

intermission was inherent in the centres, but was normally restrained, and the contraction rendered uniform by some influences, perhaps complex. One such influence might be the mutual action of opposing centres. A case was mentioned of disease of one side of the pons, with loss of the movement towards that side, in which there was nystagmus in the movement towards the opposite side; and, two years ago, he had brought a case before the Society, in which an acute lesion on one side of the pons caused deviations towards the opposite side, with nystagmus. But many more facts as to the position of lesions causing nystagmus were required, before the speculation as to its mechanism could, with profit, be carried further.

Dr. Hughlings Jackson, after remarking on the value of the case so thoroughly investigated by Mr. Jessop, and on the excellence of Dr. Gower's paper, said that he had long held that nystagmus and tremor signified paralysis. He believed that, notwithstanding the complete excursions of the globes, there was loss of some few ocular movements in the case of Mr. Jessop's patient. It was of very great importance to distinguish between loss of power of muscles and loss of movements. In nystagmus there was, he thought, loss of some movements and development, and sometimes over-development of other movements of the very same muscles. He considered that in miners' nystagmus and the other professional cramps (writers' cramp, for example) there was loss of some movements, with forcing of other movements of the same muscles. If, after gazing out of a rapidly moving railway carriage, one looked at the seat, the seat seemed to move; here was negative after-movement; there was loss of a few ocular movements with over-development of other movements. Was there not here nystagmus in the making? It was submitted that there was temporary exhaustion of some cells of the lowest motor centres for certain ocular movements. If one might make the ridiculous supposition that a man's occupation consisted in looking out of a railway carriage window, he might come in time to have railway travellers' nystagmus, the genesis of which would point to a paralytic element—loss of some movements owing to atrophy of some cells of lowest motor centres, with over-development of other movements. He next adverted to a case of hemiplegia from disease of the upper part of one-half of the pons Varolii with turning of the eyes from the side

of the lesion—*i.e.*, to the side paralysed—which had been investigated by Dr. Gowers and himself ("Medical Times and Gazette," January 3rd, 1874). It was well known that there were in cases of epileptiform seizures the mobile counterparts of ordinary hemiplegia with deviation of the eyes from the side paralysed. He thought he had twice recently seen the mobile counterpart of the hemiplegia from disease of the pons he had mentioned; really tonic spasm of the limbs of one side with turning of the eyes to the other side, presumably depending on discharge beginning in some part of the pons. He mentioned the case of a boy, reported to the Medical Society in November last, who had fits when his head or face was touched. In the fits the eyes turned to the right; there was hemiplegia of the left side. A case of more direct ophthalmological interest was that of a patient who had paroxysms of lazy clonic, almost tonic, spasm of the right side of the face, but of the two orbiculares palpebrarum, and turning of the two eyes to the left. Fully aware that face fits occurred from limited discharges of the mid-cortex, he believed the face fit mentioned to belong to the class of ponto-bulbo-spinal fits (lowest level of evolution). The work the ophthalmologists were doing in precisely distinguishing losses of ocular movements from paralyses of ocular muscles was of vast interest to the neurologist. He had never seen loss of ocular movements in cases of general paresis, except perhaps in one case in which there was a want of smoothness in the excursions of the globes, not amounting to nystagmus. Theoretically, loss of some movements would be expected, and, theoretically, a change so slight as not to amount to that supposed to occur in nystagmus.

Mr. Priestley Smith remarked that in all forms of deviation of the eye the apparent movement of the false image is opposite in direction to the movement of the cornea. In certain cases of nystagmus, however, it was said that the apparent movement of the object corresponded in direction with the movement of the eyes. Might it not be that the appearance of movement occurs during the return of the eyes rather than during their primary movement? The return movement, being probably due rather to physical elasticity than to muscular action, is slower and less sudden than the primary movement, which is due to sudden short muscular contraction.* Had nystagmus of a kind

* If the primary nystagmic movement is a paralytic movement, *i.e.*, if it represents a conscious impulse insufficiently executed, the excursion of

corresponding to the normal movements of convergence and divergence ever been met with? He had looked for such cases for years, but had seen none. How was it that convergence was not at times disturbed in this particular way, when so many other co-ordinations were apt to become nystagmic? The fact that the movements in nystagmus were sometimes of a simpler or more isolated kind than those which we could produce by efforts of the will, favoured the supposition that the disturbance was in lower rather than in higher centres of co-ordination; thus, in some cases, the obliques only appeared to be involved, and, in certain rare cases, vertical nystagmus of one eye only was present. The higher volitional centres never produced these forms of movement otherwise than in co-ordination with others. In illustration of the interrupted character of even healthy ocular movements, to which some reference had been made, he referred to a phenomenon which might be observed by anyone whose retina happened to be, for the time being, somewhat too retentive of after images. Looking from one side of the landscape to the other, while the sun was pictured on the retina, the after-image was not a continuous streak of light, as it would be if the movement were unbroken, but a series of adjacent images of the sun, representing so many halts in the movement of the eye.

Dr. Gowers, in reply, said that the fact that in nystagmus objects sometimes appeared to move in the same direction as the quick movement of the eye was of great importance, as probably affording grounds for ultimately distinguishing the functional relations of the phenomenon in different cases. It brought the movement into relation with vertigo, with which it was sometimes associated, and in which the sense of movement in the individual and in external objects usually agreed in direction. The explanation of the agreement was to be found in the motor character of vertigo, and in the fact that any resulting movement was secondary, and fell short of the actual motor tendency which was felt as a sensation. If a person turned round, and an object remained opposite to his eye, he inferred that the object moved in the same direction

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the eyes falling short of that intended by the motor centre, then we have a "lagging" which is equivalent to a deviation in the opposite direction. On this supposition the paradox disappears and the explanation suggested above falls to the ground. (See the remarks of Dr. Hughlings Jackson and the reply of Dr. Gowers.)—P.S.

as he did, and a sensation of movement led to the same inference; actual movement would only prevent the inference if it were equal to the tendency, and there would only be a sensation of movement in the opposite direction if the actual movement were in excess of the tendency.

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THE PUPIL-SYMPTOMS MET WITH AFTER INJURIES TO THE HEAD.

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I am only too conscious of the imperfect nature of the following review, but hope that some of the cases related may prove of interest, or serve as fragments of evidence, from which conclusions may ultimately be drawn as to the true meaning of the conditions of the pupil met with after injuries to the head and neck, &c. The surgeons of the London Hospital have kindly allowed me to use the notes in several of the cases, and to Mr. Waren Tay I am also indebted for having given me the same permission with regard to patients attending under his care at Moorfields. The notes as to the pupils, &c., were, in most of the cases referred to, made by myself, and I must apologise for their frequently incomplete nature.

In looking over previous records bearing on the subject, the want of exact statements with regard to the size of the pupil is painfully felt, and I have omitted a good many interesting cases on this account. The terms used, paralytic mydriasis and myosis, &c., have the same meanings as those employed in my father's papers on "Pupil-Symptoms," published in "Brain," Vol. I., and as ordinarily understood. But with regard to the muscles and nerves concerned in producing mydriasis it may be well to introduce a short note.

A warm discussion has been lately held as to whether the human iris possesses any dilator muscle, the affirmative being maintained by Iwanoff, Merkel, Jeropheeff, and Henle (I mention only those who have investigated the question by independent histological research), whilst Grünhagen resolutely denies the existence of any such muscle, and is supported to some extent by various observers who admit the great difficulty of demonstrating its presence. For a full review of the dispute see Iwanoff in de Wecker's "Traité Complet d'Ophth.," Vol. II., p. 268. The most interesting contribution to the subject that has of late appeared is by Dr. Gaskell, in his extremely important paper on the "Structure and Function of Visceral Nerves" ("Journal of Physiology," Jan., 1886). Dr. Gaskell sees "no urgent necessity for a special musculus dilator pupillæ; variations in the extent of the contraction or relaxation of the sphincter are quite sufficient to account for all the differences in the size of the pupil, if only the radial fibres of the iris possess, as Grünhagen thinks they do, a sufficient amount of elasticity." Dr. Gaskell points out the close resemblance of the nerves which dilate the pupil to those which inhibit the circular muscles of the intestine, and hence speaks of the former as the cervical splanchnic, although, perhaps, it would be more convenient to use the term pupil inhibitor. The existence of such inhibitory action on the part of the cervical sympathetic will probably come to be universally admitted, although there may be in addition dilator fibres, the presence of which in birds and certain other animals is not denied. As Gaskell observes, "the attempt to attribute dilation of the pupil to contraction of the blood-vessels of the iris is, for several reasons, not worthy of serious discussion."

The Pupils in Concussion of the Brain.—During the collapse stage the condition is fairly constant; that is, the pupils are neither contracted nor dilated, and they respond to strong illumination. This response is not

always so rapid as it should be normally; not infrequently the pupils tend towards slight myosis, and inequality is occasionally seen. When one pupil only is markedly dilated there are sometimes signs of irritation, probably by small hæmorrhages into the cortex on the same side, as in the following case :—

CASE 1.—*Concussion, Irritation of the Centre for Flexion of the Right Arm, Mydriasis on the Left Side.*—James R., aged 10, was struck on the upper part of the left parietal bone by a heavy piece of wood. There was a considerable hæmatoma and some suspicion of a depressed fracture. On admission, very shortly after the accident, there was marked clonic contraction of the right arm, which passed off after several hours. At the same time there was wide dilatation of the left pupil; this also gradually disappeared, and on the third day both pupils were equal and mobile.

Whatever view be taken as to the condition of the cerebral circulation (and both extreme congestion and anæmia have been found in cases of death from concussion), it is not doubted that the cerebral functions are, to a more or less complete degree, suspended by the violent shaking that the brain undergoes. Hence the condition of the pupils would be expected to be the same as during sleep and the anæsthetic stage of chloroform inhalation, and in the animals deprived by experiment of their cerebral lobes.

Budin and Coyne ("Archives de Physiologie," 1875), experimenting with chloroform, found that after the period of dilation of the pupils in the excitement stage, one of myosis supervened when full anæsthesia developed, the pupils remaining sensible to stimuli; but Schiff and others have not found that any great degree of contraction could be observed.

In a few cases of concussion fixed mydriasis on both sides is noticed for a time.

CASE 2.—A. B., aged 33, received a blow on the vertex from some falling timber. The concussion symptoms were only slight, and he was unconscious for a few minutes only.

When admitted both pupils were widely dilated, and acted neither to light nor during convergence. This condition lasted a few hours and then disappeared.

It is impossible to account for such a case on the supposition that the contractor centres in the corpora quadrigemina were paralysed, since the concussion symptoms were so little marked. Is the mydriasis in such cases due to irritation of the nerves in the dura mater? Bochefontaine ("Archives de Physiologie," 1879, p. 15) found that on irritation applied to the dura mater in dogs decided temporary mydriasis ensued, just as on irritation of sensory nerves in any part of the body. Dr. Ferrier has found that irritation of the posterior part of the superior frontal convolution of either side is followed by dilatation of both pupils, attended with movements of the eyes and head; in fact, his experiments show that, in the animals nearest related to man, "the actions of the pupil in connection with stimulation of cortical regions is always an associated action, and never, so far as I have seen, occurs alone."

It will, consequently, be best to record the following case without attempting an explanation of the pupil-symptom :—

Case 3.—John McC., aged 40, was struck on the head, the scalp being wounded above the right frontal eminence. He was not unconscious, but rather weak from loss of blood. The left hand was distinctly weaker than the right, and the left pupil larger than the other ; both conditions passed off after a few days.

Whilst it must be admitted that at present it is impossible to fully account for the cases in which one-sided mydriasis follows concussion and persists for a considerable time, it may be noted that they are very exceptional without evidence of severe injury to the brain (as in compression, &c.) Occasionally they are to be explained by injury to the third nerve or its nucleus, as in following case :—

Case 4.—*Injury to Third Nerve the only After-symptom of Concussion.*—Thomas H., aged 32, fell sixteen feet into a barge,

striking the left side of his head, but there was no wound. He was partially unconscious for a few hours, but no other symptoms persisted. From admission it was noticed that there was ptosis on the left side, the left internal rectus did not act well, and the left pupil was dilated. There was partial paralysis of accommodation on this side also. The fundus was normal, and near vision alone affected. At the end of four weeks these symptoms still persisted.

Partial or complete rupture of the third nerve has been found occasionally in post-mortem examination of cases of severe concussion. Thus my father reported in his "Astley-Cooper Prize Essay" of 1865 (p. 38 of the Catalogue) the case of an elderly woman who was knocked down, and admitted with various symptoms of fractured base, and complete paralysis of the left third nerve, which was subsequently found to be partially torn close to its origin from the crus cerebri, the posterior clinoid processes being fractured. I have seen in a post-mortem on a case of fractured skull with cortical hæmorrhages, a small extravasation from the under surface of the velum interpositum resting on the corpora quadrigemina, but cannot state the condition of the pupils during life.

Passing now to the after results of injuries to the cortex and deeper parts of the brain, it may be said to be the general rule that, with the onset of inflammatory reaction, the pupils become strongly contracted, although the lesion may be at some distance from the corpora quadrigemina. The following case is an example :—

CASE 5.—*Severe Injury to L. Arm Centre—Persistent Double Myosis.*—Robert Cross, aged 40, a platelayer on the railway, was stooping forward on the line, and received a blow from some projecting part of a passing train, so that a piece of the skull just to the left of the middle line was comminuted, and the brain matter beneath crushed, some of it coming away. The injury, as shown by the post-mortem, was a remarkably limited one. The upper end of the ascending frontal and parietal gyri, and the adjoining part of the superior frontal, were as though punched out, the subjacent white matter being

involved. This was the only injury to the skull or brain beyond the concussion. He never fully regained consciousness after the accident, and had incontinence of urine, but the only part paralysed was the right arm. When pinched on this, he would resist with the left arm, and neither the facial muscles nor the legs were paralysed. The knee-jerks were absent. On the day of admission his pupils reacted to light, and they soon passed into a condition of great contraction. On the fifth day I noted :—"Pupils equal, only 2 mm. in size in dull light; contract still further in bright illumination." With the spreading inflammation of brain that followed (without meningitis and only round the injured part), the limbs became more powerless, but even on the day of his death he could move the left arm somewhat. His temperature ranged between 100° and 103°, and he died quietly on the eighth day from the accident. The extreme contraction of the pupils continued up to the day of death.

Particulars of several other cases of "irritative traumatic lesions" situated towards or in the cortex could be given in which fixed myosis prevailed until the onset of death by coma, as a rule, led to mydriasis, though even then the pupils may sometimes remain contracted. Thus in a case of my father's ("Astley-Cooper Essay"—Catalogue, p. 29) a man who had sustained a severe contusion of the right temporo-sphenoidal lobe and hæmorrhage into the optic thalamus presented double myosis on the second day, and on the fourth it was noted "death in coma, with contracted pupils and rapid pulse." At the same time there are many circumstances which may lead to exceptions to almost any rule as to pupil-symptoms after severe injuries to the head.

Nevertheless, one can hardly doubt that, with our increasing knowledge of cerebral localisation and physiology, these exceptions will be explained, and the accumulation of clinical evidence will enable us to attach more importance to the condition of the pupils than is at present possible.

(To be continued.)

TWO CASES OF IRIDODIALYSIS FOLLOWED BY UNUSUAL RESULTS.

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Iridodialysis, or tearing of the iris from its ciliary attachment as a result of contusive or non-penetrating injuries of the eyeball, is not so uncommon an event as to deserve a special description of every instance in which it occurs, and the following cases would not have been published were it not that they present unusual features.

Case 1.*—*Iridodialysis followed by complete reunion of the detached portion of iris.*—J. L., aged 17, presented himself at Mr. Swanzy's clinique, at the National Eye and Ear Infirmary, Dublin, on the 22nd of April, 1884, stating that he had received a blow of a stone in the left eye an hour previous to his admission. On examination, the ocular conjunctiva was somewhat congested; the cornea and sclerotic were intact, and there was a trace of blood in the anterior chamber. The ciliary margin of the iris at the outer side was torn from its insertion, the rupture involving rather less than one-third of its circumference. The injury presented the usual appearances—double pupil, etc. The lens was not dislocated. Tension normal. Vision was reduced to counting fingers at 8″, although there was nothing visible to account for this defect of sight, as the media were perfectly clear and the fundus normal. It was probably due to functional disturbance of the retina from shock (traumatic anæsthesia of the retina).

The treatment consisted in atropine instillations and bandage.

April 25th, four days after admission, he felt severe pain in the eye, which became tender on pressure. The anterior chamber was full of blood and vision was reduced to perception of light.

* The notes of this case were taken by Mr. Haines, who was House-Surgeon at the time. I have also to thank the Surgeons of the Infirmary (Mr. Swanzy and Dr. Fitzgerald) for permission to publish the cases.

April 27th.—There was no longer p. l., and this condition lasted for a few days.

May 7th.—Anterior chamber now free from blood, pupil widely dilated, and no iridodialysis visible. Vitreous still full of blood. V = p. l. From this time he gradually improved, and was discharged on May 10th, with V = $\frac{6}{60}$.

In June, V rose to $\frac{6}{18}$. Eserine was dropped into the eye, and although the pupil contracted well, no rent could be discovered in the iris.

I have seen the patient two or three times since, and have been unable to detect any rupture even with the ophthalmoscope.

Cases of cured iridodialysis must be very rare; indeed, I have only succeeded in discovering a single example on record, and even there the union was not complete. In this case, which is described by Moorehead ("Brit. Med. Journ.," 1876, p. 250), the injury involved one-sixth of the circumference of the iris; the rupture healed, leaving only the merest trace of its existence. The cure was here attributed to the early approximation of the margins of the rupture by means of atropine, which was instilled a short time after the accident had occurred. In the case described above, only one hour elapsed between the treatment and the injury. The question of time seems, no doubt, an important one, and it is quite reasonable to suppose that the fresher the two surfaces are, the more readily will they unite; but that this is not the sole, and probably not even the chief, factor which promotes the healing of the wound, is evident from the fact that union occurs so rarely, even after early treatment. It is also remarkable that even very small detachments of the iris usually remain permanently ununited.

Case 2.—*Iridodialysis with anteversion of iris.*—I. Kerr, aged 34, a slater, was struck on the right eye by a piece of a broken chair, on the 17th May, 1885. When first seen, three days after the receipt of the injury, the eyelids were somewhat swollen and ecchymosed, there was slight proptosis, and although the conjunctiva was chemosed it was not congested,

the exudation probably being of a serous nature. The cornea and sclerotic were uninjured. A hæmorrhage in the anterior chamber concealed the pupil and the inner half of the iris, only a crescentic portion of the latter being visible at the outer side. No red reflex with the ophthalmoscope. V = fingers at 6 metres. Cold compresses and atropine. May 21st, the hæmorrhage having partly disappeared, I discovered that the inner half of the iris had been completely torn off at its ciliary margin, and was now lying on the outer half, with its dark brown uveal surface looking forwards; it covered the pupillary margin of the remainder of the iris, leaving only a crescentic portion of the latter visible at the outer side. The two halves of the iris were still continuous above and below at the points where the folding forwards of the loose portion took place. The lens was uninjured. Two days later the media became sufficiently clear to exhibit the red reflex which reached the very margin of the cornea at the inner side.

The following day he complained of pain in the eye, which was accompanied by congestion, photophobia, and lachrymation, and as the irritability increased, an attempt was made by Dr. Maxwell to remove the detached portion of iris, but this failed, as its under surface was adherent to the outer half.

On the 4th of June the eye was still more congested and painful, an exudation or detachment of the retina appeared at the lower part of the fundus, and there was no longer perception of light.

Enucleation was performed on the 6th of June, on account of symptoms of sympathetic irritation in the left eye.

The following are the varieties of lesions of the iris which may be caused by diffused or non-penetrating injuries of the globe:—

1.—*Dilatation of the pupil.* This is usually attributed to paralysis of the sphincter iridis, but Hirschberg ("Centralblatt f. Aug.," December, 1886), in a note to a paper on rupture of the sphincter, by E. Franke, states that whenever the dilatation is permanent, a rupture exists.

2.—*Tearing of the pupillary margin or sphincter of the iris.*

3.—*Rupture of continuity of the iris, not reaching the pupillary or ciliary margin.* A single case recorded by Lawson.

4.—*Iridodialysis.*

5.—*Traumatic coloboma.* This is regarded as doubtful by De Wecker.

6.—*Retroflexion of iris* (Umstülpung), *i.e.*, folding of the iris backwards towards the ciliary processes ; it may be complete or incomplete, and only involve a portion of the breadth of the iris.

7.—*Traumatic aniridia.* Several cases have been described in which the whole iris was torn away ; in some it lay in the anterior chamber folded up into a small mass, while in others it was expelled from the globe under the conjunctiva. Finally, Mauthner records an extraordinary instance (" Bericht. der Naturw. Medic. Vereins in Innsbruck," II., p. 197-199), in which the whole iris was driven through a rent in a detached retina into the subretinal fluid.

To this list may be added the condition described in Case 2 above, which I would call *anteversion* of the iris, inasmuch as the iris was not only displaced *forwards*, but its surfaces were at the same time *completely reversed*, without any folding concentric with its margin, such as occurs in cases of *flexion* of this membrane. It is evident that version of the iris cannot take place without the previous occurrence of an iridodialysis, while this is not necessary for a retroflexion.

Since the use of the term *version* in the above sense may appear open to criticism, perhaps I may be allowed to give a short explanation :—Displacements of the iris, due to variations in the depth of the anterior chamber, are true versions in the obstetric sense of the term, but since these alterations in the position of the iris are already involved in expressions denoting the condition of the anterior chamber they require no special names, and no confusion can occur, from applying the term

"version" to conditions which of course must involve flexion (*i.e.*, at the junction of the detached and the intact portions of the iris), but in which the flexion is radially disposed and is not concentric with the margins of the iris as in ordinary retroflexion.

R. Deutschmann (Gottingen). On Optic Neuritis, especially the so-called Choked Disc, and its connection with Brain Diseases. *Jena. Gustav. Fischer.*, 1887.

In a monograph of sixty-eight pages, Deutschmann discusses in a masterly manner the pathology of optic neuritis, a subject upon which his own experimental researches have thrown much light.

Authors are agreed that the optic neuritis which accompanies basal meningitis and other inflammatory diseases of the brain is an inflammatory condition, the inflammation being transmitted in some way from the brain to the papilla. The opinion is still held, however, by some observers, that the so-called "choked disc" (stauungspapille) represents a process of different type, depending upon compression of the nerve at its entrance into the globe, œdema of the papilla, and so forth. This supposed essential difference has been strenuously denied of late years. Leber at the International Medical Congress of 1881 declared the choked disc to be merely an intense form of neuritis; Hutchinson has always regarded the conditions as different grades of the same process; Gowers points out that the compression, which is undoubtedly present, is a secondary result of inflammatory swelling in the papilla.

Deutschmann is of entirely the same opinion. He states that in all the many cases examined before and after death by Leber and by himself, the changes could only be regarded as due to inflammation. In all there is exudation, with lymph corpuscles, in the tissue of the papilla and the surrounding retina, proliferation of connective tissue, and thickening of nerve fibres; sometimes an aggregation of lymph cells in the sheaths of the central vessels; and always an inflammatory change in the choroid adjacent to the disc, presenting dilatation of vessels, and more or less infiltration with lymph cells. In

short, the microscopic appearances are indistinguishable from those of the papillitis, which accompanies leukæmia and nephritis. Further, it is noteworthy that the appearances of the so-called choked disc are met with, according to Brailey and Williams, in many cases of injury of the eye, where compression of the disc, as an essential cause, can play no part. Gowers states that in sections of the choked disc there is never any evidence of compression of the vessels at the point where they pass the scleral ring, but that such compression, when it occurs, is the result of the inflammatory swelling in the tissue of the papilla. Moreover, it is to be noted that the supposed agent in the choking of the disc, the fluid distending the nerve sheath, is by no means always present, even when looked for with every precaution in the way of ligaturing the nerve.

From the anatomical standpoint, therefore, Deutschmann arrives at the following conclusions:—The so-called "choked disc" (stauungspapille) is from the beginning an inflammatory condition—a true neuroretinitis. There is no anatomical evidence in favour of the supposition that it is caused by compression of the ocular end of the nerve; the anatomical facts are opposed to this assumption.

In the next place, Deutschmann clears the ground for his own fresh contributions to the subject by reviewing the various theories which have from time to time been put forward.

Von Graefe believed that encroachment upon the intracranial space, from whatever cause arising, compressed the cavernous sinus, and hindered the efflux of blood through the ophthalmic vein; hence stasis of venous blood in the eye and changes in the papilla. As an auxiliary cause he pointed to the scleral ring which, during swelling of the nerve end, would by its unyielding resistance intensify the compression there occurring. This theory is overthrown by the fact that the superior ophthalmic vein communicates freely with the anterior facial vein, and that complete and lasting compression of the cavernous sinus does not cause stasis in the eyeball. In certain cases of neuritis with cerebral tumour, Von Graefe believed, however, that a meningitis in the neighbourhood of the tumour descended by continuity to the disc.

Hughlings Jackson, Brown-Séquard, and Benedict have suggested that the changes in the papilla may depend upon a

vasomotor or reflex neurosis, but the idea is not supported by evidence, and is not easily reconcilable with our present pathological knowledge.

Schwalbe's discovery of the communication between the sub-arachnoid space of the skull and the sheath of the nerve, appeared to give fresh support to the compression theory. Schmidt and Manz advanced the view that any increase of pressure within the skull would drive an excess of cerebral spinal fluid along the sub-vaginal space of the optic nerve, and thus cause compression and choking at the disc. Manz supported this theory by showing experimentally that injection of fluid into the arachnoid space does actually cause vascular changes in the papilla.

Kuhnt, following on the same lines, suggested that the choking of the disc was due rather to stasis of the lymph streams at this point than to compression of blood-vessels. This hypothesis also fails to explain the occurrence of inflammatory changes in the papilla.

Parinaud came to the conclusion from post-mortem observation that papillitis, whether from tumour or from meningitis, is always associated with hydrocephalus. He supposes that distension of the ventricles causes lymph stasis both in the brain and in the optic nerve, and hence the swelling of the papilla; the choked disc, according to him, gives evidence only of cerebral œdema.

Ulrich thinks, with Parinaud, that œdema is the main factor, but thinks that it has the effect of compressing the central vessels in the papilla, and thus producing the changes at that spot. Certain of the tissue changes which Ulrich regards as evidence of œdema in the optic nerve, Deutschman believes to have been produced by the celloidin-method of preparation.

Schultén, on the ground of original experiments on animals, has lately come forward as an advocate of the compression theory of Schmidt and Manz. He raised the intracranial pressure by means of injections of salt solution into the sub-dural and sub-arachnoid spaces. He produced thereby a narrowing of the arteries, and an over-filling of the veins in the retina; he assumed that these vascular changes were caused

by compression of the nerve by fluid in its sheath, and that they truly represented the first stage of the condition known clinically as choked disc.

In other experiments, Schultén raised the brain pressure by injections of oil, wax, or gelatine, and by the introduction of small india-rubber bladders between the dura-mater and the skull. In this way also he obtained the vascular changes in the disc described above. The changes occurred when the intracranial space was reduced by five or six per cent.; a reduction of ten per cent. produced convulsions and stoppage of respiration. The retinal changes disappeared on the second day, although the pressure was maintained. They disappeared also in animals which lived many days after the introduction of masses of wax within the cranium, and in no case led on to the typical appearances of choked disc.

Deutschmann, accepting these observations as accurate, denies that they support the compression theory of choked disc. The vascular changes produced were not proved to be the beginning of the morbid process in question, or to be produced by compression of the ocular end of the nerve by an excess of fluid in its sheath. To settle the matter more positively he determined to solve, by means of further experiment, the two following questions :—

1.—What degree of hydrops of the optic nerve in animals is required to produce changes in the disc similar to those of the choked disc in man ?

2.—Are there any conditions under which a moderate and even transient hydrops of the nerve, such as is often found post-mortem in man, is associated with the occurrence of choked disc ?

For the determination of the first question he made injections directly into the nerve sheath. Dividing the superior rectus he laid bare and cut through the optic nerve in front of the optic foramen ; then drawing forward the distal end, and taking special care not to rupture the central vessels at their entrance into the nerve trunk, he injected warm sterilised agar-agar solution, the advantage of which is that, at the body temperature, it remains of a soft semi-fluid consistence, and is only very slowly absorbed. A ligature being then applied to the nerve, the divided muscle was sutured, and the wound

closed; the whole with antiseptic precautions. Healing followed almost without trace of the operation. By filling the nerve sheath very forcibly he obtained ophthalmoscopic evidence of a total arrest of circulation in the retina, and a few hours later a swelling and turbidity of the papilla much resembling the choked disc in man. Microscopic sections showed a well-marked compression of the nerve close to the globe, swelling and œdema of the papilla, and so forth; but no trace of a true neuritis or peri-neuritis. When the injection was less forcible. however, though still sufficing to produce a more marked hydrops than is usually found in the human subject, he obtained only a temporary diminution of the arteries, and an over-filling of the veins; moreover these vascular changes disappeared in an hour or two, and microscopic examination, several days later, showed no trace of pathological change either in the nerve or the papilla.

Deutschmann concludes that in animals a choking of the disc comparable with that which occurs in man can only be produced by pressure sufficient in amount to arrest the circulation. No one, he points out, has found a degree of hydrops in the human optic nerve approaching to this required amount; no one has found a condition of simple œdema without trace of commencing inflammation: no one has seen evidence of actual compression of the nerve; moreover, the frequent retention of good vision in such cases refutes the idea of an arrested circulation.

In the next place Deutschmann made injections into the cranial cavity in order to fill the nerve sheath by means of an excess of pressure within the skull. He used agar-agar, coloured with Indian ink, and rendered fluid by warmth. He repeated the injection from time to time in the same animal, and employed strictly antiseptic measures. He thus established not merely a transient excess of pressure in the skull, but one which was renewed from time to time; and by the antisepsis he obtained the effects of pressure without inflammatory complication. A well-marked injection of the optic nerve sheaths, fully equal in degree to that which is found in the human subject under conditions of morbid pressure in the cranium, and lasting for several weeks, was produced. Dissection

showed that the sheath was forcibly distended, but that the papilla, the nerve trunk, and its sheaths were absolutely free from any trace of inflammation.

From these experiments Deutschmann concludes that an excess of intracranial pressure, with distension of the optic nerve sheath, does not of itself suffice to produce the choked disc. The transient vascular changes visible after each rise of pressure cannot be regarded as the first stage of the morbid process in question.

Leber, in 1881, expressed the belief that hydrops of the optic nerve is concerned in the production of choked disc in a manner other than that assumed in the compression theory: intracranial tumours and tuberculosis are accompanied by vascular congestion, hydrops of the ventricles, and increase of pressure; products of the new formations, mixing with inflammatory exudation and with cerebro-spinal fluid, are carried into the intervaginal space of the nerve, and at its bulbar extremity excite inflammation of its tissue. Deutschmann adopts this theory, and gives experimental evidence in its favour. To test it he repeated his injection experiments, but used an infecting instead of an aseptic material.

Solution of common salt containing traces of staphylococcus, injected directly within the sheath in the manner already described, caused, after two or three days, an extreme papillitis; the first day after the injection the papilla was reddened and swollen, the veins distended, the arteries perhaps narrowed; the following day the papilla was greatly swollen and the retina turbid; the microscope showed well-marked neuritis and perineuritis. Injections of the same infecting material into the skull failed to produce the same result, the reason being that if sufficient infection occurred to produce any symptoms, the animal died through acute brain changes before time had elapsed for the nerves to become affected. It was necessary, therefore, to employ an infecting material of more gradual action, and for this purpose tubercular matter was selected.

A few drops of tubercular pus were injected with antiseptic precautions into the subdural space; no reaction followed; the animal remained apparently healthy; only a momentary dilation of the retinal veins was observable. Three weeks later the papilla began to redden, and the veins to become tortuous;

swelling of the papilla followed, and then these changes either subsided or became gradually more intense, until typical appearances of papillitis were developed; the process reached its acme in the fifth week, and then gradually subsided, leaving the appearances of a post-neuritic atrophy. The microscope showed widely spread miliary tuberculosis of the meninges; the intracranial portion of the nerve normal, the orbital portion more or less altered, the sheath being distended more or less with exudation in the early stages, and occupied with tubercle deposits in the later; the nerve and its sheath being both inflamed. It was evident that the changes in the papilla were not pressure effects, for they were present before any considerable tubercle masses had formed in the sheath.

The conclusion drawn from these experiments is as follows: The inflammatory affection of the papilla which leads on to the choked disc does not depend upon pressure; it is excited by an irritating fluid which passes, together with the cerebrospinal fluid, from the cranial cavity along the nerve sheaths, and which is arrested at the bulbar end of the nerve, and there produces an infective action.

Finally Deutschmann discusses the validity of this theory from the clinical standpoint.

Intracranial tumour is the commonest cause of choked disc; cases of tumour without affection of the optic nerves are, according to statistical evidence, very uncommon. The precise seat and the nature of the tumour appear to make no difference in this respect. Further, it appears that in all cases of tumour with papillitis there is an excess of fluid within the skull. Leber's idea is that by means of this fluid, and the abnormal pressure under which it is secreted, certain products of tissue change in the tumour are carried along the sheath of the optic nerve, and there excite inflammation. The pressure, therefore, is a favouring but not an essential condition in the process. Deutschmann suggests that the irritating elements which excite the papillitis are, perhaps, micro-organisms which, being already present in the system, congregate around the tumour as a "place of least resistance," and are thence carried to the optic nerves in the manner described. Certain microscopic observations appear to favour this view, and he offers it as an alternative to the hypothesis that tissue changes in the tumour suffice to

produce the irritating elements. For the rare cases of brain tumour without papillitis, it may be assumed either that the patient dies before the process is completed, or that a slight papillitis has occurred, and disappears leaving no trace behind.

Gummata and tubercle of the brain, as causes of papillitis, are not difficult to explain. That tubercle can produce papillitis in the manner described has been proved by experiment. That syphilitic products are capable of exciting an infective inflammation is well known. The reason that specific inflammatory products are seldom to be found within the nerve sheath is probably that tubercular subjects usually die before tubercle masses have had time to form in this situation, and that those who suffer from gummata are usually cured. Both formations have, however, actually been found, so that the possibility of such an infective process is established.

Entozoa of the brain resemble tumours in that they are associated with inflammatory secretions. In these cases also Deutschmann supposes that there may be an aggregation of micro-organisms, which, pre-existing in the system, find here an especially favourable position.

Abscess of the brain often causes papillitis, and often fails to do so. In the latter case probably the infective material of which the abscess is the outcome is encapsuled by the abscess-wall more completely than in the former.

Meningitis of various forms may without difficulty be supposed to cause papillitis by the infecting process in question. A true descending neuritis—*i.e.*, an unbroken continuity of inflammation, is rarely demonstrable, and in view of the facts now brought to light is no longer necessary to explain the papillitis. Its occurrence cannot be denied, but in Deutschmann's opinion the inflammatory process in the nerve is generally an ascending rather than a descending neuritis; that is to say, the bulbar end is infected earlier than the nerve sheaths, and from this point inflammation spreads backwards.

Primary hydrocephalus internus appears in rare instances to cause papillitis, but it is not unlikely that the hydrocephalus arises from inflammation of the ventricle walls, or of the choroidal plexus, the continuity of which with the basal pia mater would explain the migration of infection to the nerves.

Simple atrophy of the optic nerves, due probably to the pressure of the distended third ventricle upon the chiasma, is much commoner than papillitis in these cases.

Malformations of the skull are sometimes associated with papillitis. Inflammation of the cranial bones, sometimes manifestly due to hereditary syphilis, affords a probable explanation.

Cerebral softening after embolism is rarely associated with papillits, and is never probably its actual cause.

Cerebral hæmorrhage is probably never, of itself, a cause of papillitis. Hæmorrhagic pachymeningitis, with which papillitis may occur, is a form of inflammation of the meninges. In certain cases an unrecognised neoplasm may be the source of the hæmorrhage, and the cause of the papillitis which is found in association with it. In other cases, it remains doubtful whether disease of heart and kidneys are not the common cause of cerebral hæmorrhage and changes in the fundus oculi. The only cases in which the effect of an extravasation of blood can be studied apart from possible complication by systemic changes are those of recent injury. It appears that papillitis in cases of uncomplicated fracture with depression, or with outpouring of blood between skull and dura mater, is almost unknown. When such an injury is complicated by a penetrating wound, however, and meningitis follows, the conditions for an infective inflammation are present, and the occurrence of papillitis is explained. In a case recorded by Leber and Deutschmann, papillitis followed traumatism without penetrating injury. The authors believed that there was hæmorrhage at the base of the skull, and that later this was complicated by inflammation of the meninges through the influence of micro-organisms present in the system. This supposition is favoured by certain experiments on animals in which subcutaneous operations, usually followed by no reaction, had inflammatory consequences when small quantities of pus and other infective fluid had been previously injected into the system.

For those exceptional cases in which cerebral diseases usually productive of papillitis in both eyes affect one eye only, Deutschmann suggests the explanation that there exists

in the one optic nerve-sheath some unusual obstruction, either recent or of older date, which prevents the passage of the infective material.

Our review of Deutschmann's work, though it omits some minor points in the argument, and gives none of the clinical evidence which he adduces in its support, will suffice to show the great value of his researches. He has given, we think, more conclusive evidence as to the true nature of optic neuritis than has ever been given before, and has abolished once for all the idea that the so-called "choked disc" is pathologically distinct from other forms of papillitis.

Mracek (Vienna). On Syphilis of the Orbit. *Wiener Klinik.*, 1886. *Heft.* 10, *Urban and Schwarzenberg.*

Mracek notes at the outset that flat bones as a rule get diseased only through their periosteum. Syphilitic perostitis of the orbit is rare comparatively with that of the parietal and frontal bones. He then relates six cases in full detail, of which we can give only a meagre abstract.

(1.) Two years after infection periostitis of skull in various parts, including the supra-orbital arch, the inflammation and swelling extending into the lid and shutting the eye. The gummatous growth which had broken down was excised before the patient saw Mracek, the lid quickly recovered, but the scar subsequently opened, discharging some bone. Five years later there was fresh inflammation, but the lid was not involved. Potass. iodid. and mercury (Zittmann's decoction). Good recovery, with full movement of the lid.

(2.) Five years after infection periostitis of the upper and lower borders of the orbit. Growth broke down, œdema of lids, fistulous opening. Lasted half a year, but made a good recovery.

(3.) Without previous affection of skin or mucous membrane, a man, aged 33, seven months after infection (ulcer on prepuce and enlarged glands), developed gummatous disease of left orbital margin and upper lid, with exophthalmos, which partly yielded to potass. iodid. He became feverish, however, had severe headache, and died comatose after a month's acute illness. The autopsy showed syphilitic disease of frontal bone, with necrosis of part of the orbital plate, adhesion of dura mater with extensive gummatous softening of right frontal lobe, also gummata of liver. (Was this the result of seven months' disease (?))

(4.) A child, 5 years of age, had syphilitic periostitis with gummatous growths in both orbits, causing right exophthalmos and destruction of the globe, and left optic neuritis. The growths softened and discharged a purulent fluid. The disease was apparently considered scrofulous. The

autopsy showed extensive orbital periostitis, with a gumma involving the right superior rectus, and oblique in its substance. Periostitis of the orbit may result from inherited as well as from acquired syphilis.

(5.) Nine or ten years after infection syphilitic infiltration of periosteum and areolar tissue of orbit affecting obliq. inf. and abducens. Extension of process to lids, cheek, and zygoma. Had lasted four years when seen by Mracek. Under potass. iodid. and mercury he improved, but it was two years before he was well. The periosteal growths had not disappeared, but the eyes were quite free.

(6.) Ten years after infection gummatous disease of the nose, of the hard and soft palate and larynx, tumour under upper orbital margin, gumma involving muscles behind Tenon's capsule. Under treatment immediate improvement and rapid cure.

Syphilitic periostitis of the orbital margins is the most frequent form of the disease, owing to their exposure to cold and injury. It is sometimes an extension from the vertical plate of the frontal bone, but not often. It is sometimes a secondary, but generally a late tertiary manifestation. It occurs in two forms:—(1), a gummatous or destructive periostitis; (2), a sclerosing or osteoplastic periostitis, which latter may readily be mistaken for the Leontiasis ossea described by Virchow, a hyperostosis of the orbital margins having nothing to do with syphilis. The disease commences with a flat infiltration on the bones, causing pain, which is worse at night. The skin gets involved. At this stage the disease by proper treatment can be cured in five or six weeks. If allowed to go on, the growth breaks down, sinuses form leading down to diseased bone, and discharging a grumous purulent fluid. There may be exfoliation. The lid gets involved, swollen, and infiltrated. Extensive destruction of the lid may occur and cicatrices, ectropion and its consequences may result.

Affection of the Orbital Walls where the syphilitic periostitis lies behind Tenon's capsule, while rarer, is also more difficult of diagnosis and has frequently given rise to the diagnosis of carcinoma, abscess, &c., and even to the proposal to extirpate the globe. The disease generally consists of a gummatous, rarely of a hyperplastic periostitis. It is *very hard* owing to the swelling and infiltration of the periosteum and areolar tissue of the orbit. This hardness is the chief cause of mistake in diagnosis. The growth is, however, long in ossifying, remaining movable and resolvable after years. The

site is generally on the upper or upper and outer wall, rarely on the inner. Trigeminus neuralgia may for months be the only symptom. The pain is worse at night, and if there are other tertiary manifestations a diagnosis may be reached. Certainty can be gained, however, only by dislocation of the globe. If the disease begins posteriorly or extends in that direction there will be protrusion, otherwise simply lateral displacement. Syphilitic periostitis of the outer part of the orbit may readily be mistaken for inflammation of the lachrymal gland. It causes no protrusion.

Another characteristic symptom of the disease is the *restriction of the mobility of the globe* in one or more directions, with the strabismus and diplopia sometimes produced by this. It may be caused either by direct pressure, or more frequently by involvement of muscles. This last generally by an extension of the periostitic process along the short tendon of origin. *Pressure symptoms* may be produced, involving the globe and optic nerve itself and causing *neuritis* or general inflammation.

The course and result of the disease varies. The exudation may be absorbed or on the other hand it may break down, especially where the disease is in large mass, and then according to its seat and the thickness of the bones in the neighbourhood, it may (1) make its way forward and escape, *e.g.*, along the outer wall of the orbit, or (2) it may cause necrosis of bone opening, *e.g.*, into the antrum, the nose, the frontal sinus or the cranial cavity. In the last case meningitis and cerebral abscess will be not improbable results.

Treatment for periostitis of the margin may be local as well as general, iodine and mercurial ointments, unless the skin is involved, in which case use cold compresses with lead lotion. Should the infiltration have softened, an incision into, or even the extirpation of the mass when it extends into the lid, is by far the best treatment, Mracek has found, saving destruction of skin, and consequent unsightly cicatrization. The wound should be treated with iodoform, which he considers a specific for gummatous ulcers. For periostitis of the orbital wall, local treatment will not be available, unless an incision into a softened mass to relieve tension may be indicated. In both forms, however, where there is but a suspicion of syphilis, iodide of potassium or of sodium and mercury should at once

be prescribed in full doses, and if absorption is slow, Mracek would recommend a course of inunction. In the case of the slow-growing periostitic formations absorption will be extremely slow, and a combination of different modes of treatment is advisable. When the disease is seen early, a complete cure is possible, but when it has lasted long, changes in the orbital wall, or in the orbital contents. may render cure impossible. (See also, on this subject, Bull, O.R., Vol. I., p. 376.)

S. VON STEIN (MOSCOW). Cataract Produced by Sound.
Centralbl. f. Prakt. Augenheilk., January, 1887, p. 1.

The experimental methods by which cataract has hitherto been produced are the following:—1. Injury. 2. Alterations of physical conditions. Thus, Michel, in 1882, observed lental opacity after the application of ice to the globe; and a similar change has been produced by ether and by high temperatures. 3. By the local action of reagents. Deutschmann produced nuclear opacity in the lenses of sheep and pigs by means of concentrated solutions of common salt and sugar. Injections of a 5 per cent. sugar solution, and 2·5 salt-solution into the anterior chamber caused superficial opacity. 4. The introduction of chemical substances into the circulation. Kunde, and later, Mitchel, produced opacity of the lens by injections of salt and sugar into the blood.

Von Stein has now discovered the remarkable fact that cataract may be produced by the sound of the tuning fork. As an otologist he was engaged in certain experiments on the function of the cochlea. His idea was to test the theory of Helmholtz by subjecting the auditory apparatus to overstimulation by a musical tone produced by the continuous action of a tuning fork, and thus to effect a degeneration, visible under the microscope, of the particular elements, supposing such to exist, which respond to the note employed. The result in this direction is not yet given, but meanwhile an unexpected effect upon the crystalline lens was observed.

The experiments were made upon guinea-pigs. Careful observation in every case showed that the media of the eye were clear at the outset, thus excluding the natural opacities

sometimes observed in very young animals. The animal was placed in a box to which an electric tuning fork was attached. Here it was kept for several days before the fork was set in action, in order to exclude the possible influence of the confinement in the box, which admitted no light.

Experiments, eighteen in number, were made upon very young animals, with a positive result in every case.

In the first case detailed the animal was two days old. The tuning fork gave the note D, 100 vibrations per second. The animal was at first restless and squeaked. Pulse and respiration quickened. From three to four hours later the pupils were widely dilated and sluggish. After about twelve hours the posterior lens surface showed a stellate opacity, the rays of which were feather-like, especially towards the equator; there was also a general slight cloudiness of the lens. These appearances lasted about twenty-four hours. Gradually the central portion became clearer, while the star faded and finally disappeared. Meanwhile, however, three greyish-white triangular opacities made their appearance at the equator, and gradually extended towards the centre, but did not reach the latter. In four or five days all these changes had vanished, the fork acting continuously meanwhile.

With a three days' old guinea-pig, and a fork of 250 vibrations, a stellate figure appeared on the anterior lens surface at the end of twenty-four hours, and on the posterior surface the following day; the further course was the same as in the former case.

With a five weeks' old animal, and a fork of 100 vibrations, white opacities appeared after about forty-eight hours around the whole equator of the lens; all opacities disappeared in a week.

In eyes enucleated for examination was found sometimes anterior stellate cataract, sometimes posterior stellate cataract, sometimes posterior cortical cataract, or all these varieties in combination.

In adult animals no changes were produced. The phenomenon was exhibited to nearly all the oculists in Moscow.

The author expressly declines to advance any hypothesis to account for the facts observed, but we may permit ourselves some speculative consideration of the matter. An analogy at

once suggests itself between the effect of this terrifically loud music on the new-born guinea-pig and the lental disturbance which is known to follow convulsion in the human infant. There is much evidence to show that the tender growth of the human lens may be disturbed or arrested *in utero* by shocks to the system of the mother; and there can be little doubt that the nutritive disturbance which occurs during infantile convulsions suffices to damage the lens fibres then in process of formation. We can well imagine that twenty-four hours' confinement in the resonator of a tuning fork would powerfully impress the nervous system and the nutrition of a more vigorous being than a new-born guinea-pig; during the period of infancy a lental opacity seems a not improbable expression of such disturbance. It is not necessary, we imagine, to regard the cataract as a direct vibratory disturbance of the lens. It would be interesting to know whether the infant animal was separated from its mother during the ordeal, whether its temperature was maintained, whether it obtained and willingly took a normal supply of nourishment during the period in question, and whether any other signs of perturbation were present. Whatever be the explanation, the fact is most interesting.

FERRIER (London). **The Functions of the Brain. Second Edition.** *Smith, Elder, & Co.*, 1886.

Ferrier's work needs neither introduction nor praise, having already taken its place as one of our medical classics. The second edition, coming ten years after the first, contains, as he states in the preface, a detailed account of his own investigations along with a systematic exposition of the functions of the brain and central nervous system, in accordance with the best established facts of recent physiological and pathological research.

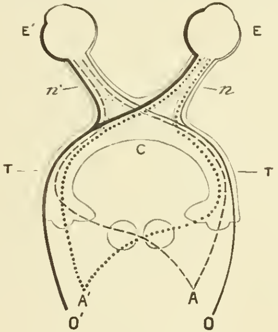
Ophthalmologists will probably turn in the first instance to the chapter on the visual centre. Here they will find that Ferrier has made a very essential addition to his former view locating the visual centre in the angular gyrus. He now locates it in the occipito-angular region on the following grounds:— Experimental destruction of one angular gyrus in the monkey causes temporary loss of vision in the opposite eye, bilateral destruction causes blindness. This Ferrier knew from his previous experiments, but owing to the fact that animals could

not be observed for any prolonged period he did not know that the blindness produced by bilateral lesion is temporary, and, moreover, varies according as the lesions are simultaneous or successive. Now, as a result of antiseptic precautions in operating, animals can be observed, perhaps we ought to say could be observed, for any length of time with the certainty that no inflammatory changes will complicate the result. He has found, then, from his more recent experiments, that the blindness of the opposite eye, caused by destruction of one angular gyrus, disappears within twenty-four hours, and the blindness from simultaneous destruction of both angular gyri disappears within four days, although in this last case the recovery was imperfect. If, however, the two gyri were destroyed successively at an interval of three weeks, there occurred after the second operation a temporary blindness of both eyes, showing a bilateral relation of the angular gyrus.

The relation of the occipital lobe to the function of vision is more complex. Bilateral destruction of the angular gyrus and occipital lobe together produces complete and permanent blindness, followed by atrophy of the optic discs and fixity of the pupils, all other sensory faculties and the motor powers remaining absolutely unimpaired from first to last. Destruction of the angular gyrus and occipital lobe of the same side produces temporary blindness in the opposite eye, and more or less enduring hemianopia in both eyes towards the side opposite the lesion. The restoration of vision in this last case Ferrier believes due to incomplete destruction of the centre. This it is extremely difficult to avoid. Where the optic radiations of the occipito-angular region are divided the hemianopia is permanent. Also after total extirpation of both angular gyri it is doubtful whether complete clearness of vision is ever regained. From these experiments it would be argued that the occipital lobe is directly related with the half of each retina on its own side, and this would certainly be in accordance with clinical results, although it is to be remembered that the lesions produced by tumour or wide-spread vascular disease must necessarily be ill-defined. Ferrier finds, however, that the occipital lobes can be injured, or cut off bodily, almost up to the parieto-occipital fissure, on one or both sides simultaneously, without the slightest appreciable impairment of vision. This is certainly remarkable, but as having been repeatedly verified by Ferrier and Yeo, and confirmed apparently by Horsley and Schäfer, it must for the present at least be accepted.*

* At a recent meeting of the Neurological Society Schäfer brought forward experiments to show that removal of an occipital lobe in the monkey causes hemianopia to the opposite side. The matter may still therefore be regarded as *sub judice*.

In accordance with the above results Ferrier amends Charcot's well-known diagram of the optic tracts and visual centres, giving each occipital lobe what we may call a hemiopic relation to the retinæ, and each angular gyrus a bilateral central relation to the retinæ, this latter partly by fibres crossing in the chiasma, partly by fibres crossing in the lower visual centres, possibly the corpora quadrigemina. His diagram seems to be in agreement with all that is known, both clinically and experimentally, of the visual centres and tracts.



DESCRIPTION OF FIGURE.

A the right, A′ the left angular gyrus; C optic chiasma; E the right, and E′ the left eye; N the right, and N′ the left optic nerve; O the right, and O′ the left occipital lobe; T the right, and T′ the left optic tract; the thin continuous line represents the retinal relations of O; the thick continuous line represents the retinal relations of O′; the interrupted line indicates the retinal relations of A, and the dotted line the retinal relations of A′; the relations of A and A′ with the eye on the same side are indicated by finer interrupted and dotted lines respectively.

The chapter on the functions of the corpora quadrigemina contains also much of interest to ophthalmologists. It is to be remembered that these bodies are connected on the one hand with the reticular formation and antero-lateral tract of the spinal cord by means of the tract of fibres called the fillet or lemniscus, which in man becomes superficial, external and anterior to the superior cerebellar peduncles, while they are connected on the other hand with the corpora geniculata, optic tracts, and cerebral hemispheres. That these bodies are by no means exclusively visual in their relations is shown by the fact that they are very fully developed in animals such as the mole, where the

eyes and optic tracts are rudimentary. Both anatomy and experiment, however, go to show that although not centres of vision proper, they are centres of co-ordination between retinal, and probably other sensory impressions, and motor adjustments. The nates are connected directly through their brachia with the corpora geniculata externa, and so with the optic tracts. The testes are connected by their brachia with the corpora geniculata interna, and from these, fibres pass into the optic tracts which form the inferior commissure of the chiasma (Gudden), not being continued into the optic nerves. The anterior tubercles alone, then, seem to have direct ocular relations, and in them lie the intercentral fibres concerned in irido-motor reäction. It is to be noted, however, that irritation of the tubercles, both anterior and posterior, causes dilatation of the pupil, first of the opposite side, then of the same side. This, in the case of the nates, is accompanied by deviation of the head and eyes upward and to the opposite side, with considerable motor manifestations. In the case of the testes it is accompanied by the utterance of cries. These phenomena Ferrier considers to be reflex, and the pupillary dilatation he regards as a sign of irritation of sensory structures.

In regard to the visual relations of the cerebellum, notwithstanding numerous experiments, Ferrier makes but little in the way of dogmatic statement. Though the cerebellum, he says, is not essential to the sense of sight, yet that it has intimate relations with the optic and oculo-motor nerves is shown by the importance of visual impressions in the mechanism of equilibration, and by the relation between oculo-motor and general motor adjustments demonstrated by experiments. A case has recently been recorded by Mendel which seems to point to the superior cerebellar peduncle as the medium of communication of optical impressions with the centres of equilibration. By the decussation of these peduncles the optic tracts would be in cross relation with the cerebellar hemispheres, and these, therefore, in direct relation with the eyes. Ferrier regards it as doubtful whether the optic thalami have any visual relation whatever, symptoms caused by their destruction being due to their proximity to the sensory fibres of the internal capsule.

We have attempted to state some of the leading results contained in Ferrier's work that are of more direct interest to ophthalmologists, but there are few facts of neurology in which the ophthalmologist is not directly interested. In this breadth of interest lies the safety of ophthalmology as a special branch of study and practice. We can cordially recommend, therefore, a perusal of the work now before us, even to those more or less specialised as ophthalmic surgeons.

ABSTRACTS OF LECTURES ON THE INTRA-OCULAR MUSCLES OF MAMMALS AND BIRDS.

Delivered at the Royal College of Surgeons of England, February 16th, 1887.

By Walter H. Jessop, M.B., F.R.C.S.,

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Lecture I.

The lecturer began by referring to the fact that one of the last researches undertaken by Hunter was with a view to find out the muscular mechanism of accommodation. He then sketched the chief work done in the subject down to the present time, especially that of Porterfield, Crampton, Bowman, Brücke, and Müller.

The intra-ocular muscles may be divided into the pupillary and the ciliary; both muscles are developed from the same layer of mesoblast, and in mammals belong to the unstriped system, while in birds they are striped.

The anatomy of the intra-ocular muscles is to be considered with regard to (1) the muscular tissue, (2) the nerves, (3) the vessels.

I.—*Muscular Tissue.*—(A.) *Pupillary Muscle.*—In all mammals there exists near the pupillary edge of the iris a circular band of unstriped muscular fibres, arranged in bundles, and varying greatly in thickness and size. The muscle lies near the posterior part of the stroma of the iris, and its muscular fibres are joined together by septa of connective tissue, which are in connection with the posterior limiting membrane, and

also with the stroma of the iris. In cats the fibrous septa are very well developed, and divide the muscle into separate bundles.

At the posterior part of the mesoblastic portion of the iris separating it from the epiblastic layer is the posterior limiting membrane of elastic tissue. With regard to this membrane much controversy has arisen, but the numerous specimens from different animals examined by the lecturer, for many of which he is deeply indebted to Mr. Beddard, lead him to adopt Grünhagen's view, viz., that there is no true dilator muscle.

In the rabbit some scattered muscular fibres exhibit a radiating course, and in the otter they are still more marked, but in the latter animal the circular fibres alone take up three-fourths of the breadth of the iris. In birds the circular fibres of the pupillary muscle are well developed, and are arranged generally as single fibres instead of bundles; single radiating fibres are also found passing from the pupillary to the ciliary border.

(B.) *Ciliary Muscle.*—In man the fibres of the muscle are arranged in three sets, viz., longitudinal, radial, and circular; but if sections in different planes be taken the fibres will be found gradually changing their directions, and shading off into one another. The extreme divisions as represented by Iwanoff in hypermetropic and myopic eyes are not constant, and the views of Brailey are probably correct, namely, that the direction of the fibres is mainly influenced by the shape of the eye, and the position of the ciliary body.

In other mammals the muscular fibres are chiefly longitudinal, and take a great part of their origin from the ligamentum pectinatum iridis; there is also present more or less pigmentation. In the apes only there are circular fibres in the position of Müller's fibres, but in swine, antelopes, &c., there are circular fibres between the sclerotic and the longitudinal fibres. The rodents possess the weakest muscle.

In birds there are generally said to be three muscles, called after their describers, Crampton, Müller, and Brücke; but though more distinct than in mammals they are probably only one muscle, as pointed out by Donders.

II.—*Nerves.*—The nerves passing into the eyeball to supply the intra-ocular muscles are the short and long ciliary, and may be considered first in their extra-ocular and then in their intra-ocular course.

The short ciliary nerves are from eight to twelve in number, and are given off by the lenticular ganglion. This ganglion is always present in mammals and birds, and is morphologically connected with the third nerve; it is always single, and may exist imbedded in the substance of the third nerve, or more usually connected with it by a short root. The ganglion has generally a branch from the ophthalmic division of the fifth nerve, usually the nasal, and in mammals often, though by no means constantly, a separate sympathetic root. The branch of the third nerve to the ganglion is derived as a rule from the inferior division, and in man from the nerve to the inferior oblique muscle, but numerous modifications are found.

The long ciliary nerves are two to four in number, and have been found in mammals to contain fibres from the fifth, and from the cervical sympathetic or cervical splanchnics of Gaskell.* The course of the latter fibres is, in the dog and monkey (Ferrier), by the second dorsal nerve to the superior thoracic ganglion of the sympathetic, and then by the *annulus Vieussenii* round the subclavian artery to the inferior cervical ganglion, and by means of the cervical sympathetic to the superior cervical ganglion. From here they pass through the temporal bone along the internal carotid artery to the front part of the Gasserian ganglion and thus gain the nasal nerve and

* Journal of Physiology, Vol. VII., p. 1.

its long ciliary branches. The long ciliary nerves are primarily branches of the nasal division of the ophthalmic, and are given off very soon after the ophthalmic has divided into its two main branches—the frontal and nasal. The long ciliary nerves then pass forward, after receiving their communications from the cervical splanchnics, along the optic nerve, and pierce the sclerotic with the short ciliary nerves.

In their intra-ocular course these nerves cannot be distinguished from each other, but run forward in the choroid along the lamina suprachoroidea, forming a fine network, and are connected with the numerous ganglion cells of the choroid. On reaching the ciliary body they form the ciliary plexus from which fibres pass off to the ciliary muscle, and others through the stroma of the iris to the pupillary muscle. In the ciliary plexus are numerous small ganglion cells.

III.—*Vessels.*—The arteries supplying the intra-ocular muscles come from the ciliary branches of the ophthalmic artery, and are arranged in the eye in three circular systems:—(1) The *Circulus Arteriosus Iridis Major*, which is at the ciliary border of the iris, and gives off numerous branches running radially in the stroma of the iris to the smaller circle; (2) the *Circulus Arteriosus Iridis Minor*, from which are given off numerous small branches to the pupillary muscle; (3) the *Circulus Arteriosus Musculi Ciliaris* (Leber), which lies in the ciliary body and supplies the ciliary muscle. The vessels of the iris have thick walls, and have been mistaken for muscular fibres; hence the idea that the human iris possesses a dilator muscle of the pupil.

The lecturer next explained the observations of Fuchs (Ophth. Review, Vol. V., p. 11) on the changes of the iris during contraction and dilatation, and the additional proofs which they afford of the absence of radial dilating muscular fibres.

(To be continued.)

THE PUPIL-SYMPTOMS MET WITH AFTER INJURIES TO THE HEAD.

By Jonathan Hutchinson, Junior, F.R.C.S.,

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(Continued from page 102.)

Surgical authorities are agreed as to the grave importance of insensitive and dilated pupils as a symptom of compression of the brain after head-injuries, as pointed out many years ago by Guthrie. During the first onset of middle meningeal hæmorrhage, however, the pupils may still react to light, and whilst they do so, "the compression of the brain is probably in a recoverable condition if trephining is immediately performed" (W. H. A. Jacobson on "Middle Meningeal Hæmorrhage," Guy's Hospital Reports, 1886). Whilst double dilatation may be a symptom materially affecting the prognosis, fixed mydriasis on one side only may, with very strong probability, be taken to indicate that the hæmorrhage is occurring on the same side as that on which the pupil is affected. This point was first brought out by my father in a paper on "Compression of the Brain," in the London Hospital Reports of 1867, and he referred it to direct pressure on the third nerve in the middle fossa of the cranium.

Before discussing the objections which may be raised against this explanation, it is well to note in what proportion of cases of compression the one-sided mydriasis is met with. Jacobson's paper includes a considerable number in which the pupil-symptoms were observed, and from an analysis of it, with a few cases which I have added, the following deductions follow. The page numbers refer to Jacobson's article.

1.—The pupil on the side of the meningeal hæmorrhage was widely dilated and did not respond to light in thirteen cases, viz., Howse's, p. 24, Godlee's,

p. 39, Beck's, p. 51, Beck's, p. 55, Jacobson's, p. 60 (fixed myosis of the other side); Hutchinson's, p. 65 (the mydriasis did not apparently come on till several days after the first hæmorrhage); Hutchinson's, p. 68 ("the patient could scarcely see with that eye"); Hutchinson's, p. 69, Hutchinson's, p. 72, Fayrer's, p. 91 (at first both were dilated); Birkett's, p. 96, Treves's (quoted later); Couper's (ditto).

2.—Both pupils were dilated and did not respond to light (fixed mydriasis) in seven cases:—Watson's, p. 23, Bryant's, p. 45, Erichsen's, p. 76, Davies-Colley's, p. 99, Ward's, p. 75, Holt's, p. 88, Gross's, p. 89. It is noted in one or two of these that the pupil on the side of the hæmorrhage was rather more dilated than the other.

3.—Both pupils were dilated, but responded to light in two cases:—Swain's, p. 44, Rivington's, p. 106 (the one on the affected side acted the least).

4.—Both were contracted and fixed in two cases:—Cock's, p. 29, Holthouse's, p. 81.

5.—The pupils were normal in three cases:—Roy's, p. 49, Jacobson's, p. 63, Ellis, p. 116 (both subsequently dilated when inflammatory reaction set in).

In the following cases, not included in Jacobson's report, the unilateral dilatation symptom was well marked:—

Case 6.—Wm. C., aged 18, admitted half-an-hour after a fall of 18 feet, in which he struck the R. side of the vertex, inflicting a wound over the parietal and exposing the bone. He was in a rather stupid condition from the concussion, but was able to sit up, and vomited an hour after admission. Five hours after admission the first compression symptom appeared, the right pupil becoming dilated and motionless. Within a very short time his breathing was stertorous, and there were convulsive movements of both arms and legs, those of the left side being more rigid than on the right. Coma deepened, and as there could be no doubt as to the occurrence of meningeal hæmorrhage, Mr. Treves trephined over the inferior angle of the right parietal, and let out a large amount of blood from between

dura mater and bone. The breathing was much improved by the operation, and he passed into a state of apparently natural sleep, but the pulse became very quick (144), and coma again coming on, he died about two hours after the operation.

CASE 7.—William Warren, aged 44, had fallen from the box of his cab, and was admitted under Mr. Couper in a state of coma, which had developed after an interval of some hours of partial consciousness. The right pupil was contracted, the left one strongly dilated, but said to respond a little to light. As he became more and more comatose, both pupils were dilated and insensitive. On post-mortem, the left meningeal was found to be torn, and over ten ounces of blood clot extravasated between skull and dura mater.

Thus, in half the cases, fixed mydriasis was present on the side of the hæmorrhage alone (thirteen out of twenty-seven cases), and in not one case was it found only on the opposite side. Probably, in several of the others, it would have been noted that before the double mydriasis developed the pupil on the same side was fixed and dilated; whether this be so or not the value of the symptom is obvious, especially since it is sometimes difficult to say on which side of the head the injury has occurred; in fact, the one-sided pupil-symptom may, by itself, become an indication for trephining. However, as we have already seen (Case 4), one-sided mydriasis may occur from other lesions than compression.

In the following very interesting case, a man sustained an injury to the head, hemiplegia followed, and it became of great importance to determine whether the paralysis was due to compression by clot or to disease of the cerebral vessels. The pupil condition was the same as that met with in seven of the twenty-seven cases, *i.e.*, double fixed mydriasis. Although the diagnosis could not be made with positive certainty, it was inferred, partly from the history of two previous convulsive attacks, that the symptoms were probably due to thrombosis of a cerebral artery, and this was verified by the post-mortem.

Case 8.—A. F., aged 51, was admitted into the London Hospital, under Mr. Treves, having fallen from the box-seat of a van he was driving, owing to the latter coming into collision with the curbstone. He had struck the back of his head, and had also sustained a severe wound of one leg; this he allowed to be sutured without apparently feeling it—in fact, though not unconscious, he was in a dazed condition, and it was suggested that he had been drinking. Six days before admission his friends reported that he had had a sort of fit, when the same suggestion was made, but he was a very temperate man as a rule. He went to work on the day following this convulsive seizure, but in the evening had a second and similar one.

A few hours after admission he was found to be breathing heavily, and the right arm and leg were partially paralysed in both motion and sensation, and he had incontinence of urine. Both pupils were widely dilated, and did not respond to light. I examined the discs several times and found no change. On the second day he was still partially conscious, could say "yes" and "no" in answer to questions, his breathing was laboured but not stertorous, his pupils were still in the condition of fixed mydriasis, the right one slightly larger than the left. The iodides of sodium and potassium were given in full doses. On the third day Cheyne-Stokes respiration developed, the pupils were the same, the right limbs were completely paralysed, but no facial paralysis could be demonstrated. He died that night, probably from respiratory failure.

At the post-mortem the left middle cerebral artery was found to be plugged by a recent clot; there was marked atheroma of the aorta and other arteries. There was no fracture of the skull or injury to the brain, but the outer part of the left corpus striatum and optic thalamus were softened, the intra-ventricular portions being not apparently affected.

To return to the "pupil-symptom" of compression. The current view, which was suggested by my father and endorsed by Jacobson, attributes it to pressure on the third nerve by blood-clot situated about the cavernous sinus or just behind it. Now, even when the pupil on the same side is alone affected, this explanation is open to certain objections.

When a meningeal hæmorrhage detaches the dura mater, it undoubtedly extends downwards towards the base as well as upwards. But owing partly to the numerous foramina in the floor of the middle fossa to which the dura mater is firmly attached, the clot finds increasing difficulty in forcing up that membrane, and it may safely be asserted that cases in which the blood has actually reached the neighbourhood of the cavernous sinus (apart from smaller extravasations inside the dura mater) are exceedingly rare. So that the pressure on the third nerve must be exerted indirectly through the crus cerebri and a considerable part of the cortex. But the pupil-symptom is found to occur before hemiplegia of the opposite side developes, as in several cases appended—for instance, in one under my own observation (Mr. Treves's case), where it coincided with convulsive movements of arms and legs, and especially with rigidity of the opposite side. Now these symptoms, with dilatation of the pupil, would be at first sight explained by irritation of the ascending frontal and superior frontal convolutions, in which, according to Dr. Ferrier ("Functions of the Brain," 1886, p. 480), are situated centres for movements of the arm and leg, lateral movements of head and eyes, elevation of eyelids, and dilatation of the pupil.

In Beck's case (No. 28 of Jacobson's list) the fixed mydriasis gave way to some degree of contraction and response to light directly after the pressure was relieved by trephining, and returned with subsequent fresh outpouring of blood. At the post-mortem it was found that the clot was not more than one-third of an inch in thickness, and that it only extended inwards as far as the openings for the divisions of the fifth nerve in the great wing of the sphenoid. This case seems conclusively to show that the one-sided mydriasis is not due to pressure on the third nerve, but is probably to be ascribed to pressure on some cerebral centre. Whether lesions of other parts of the cortex than the superior frontal lobe

will produce one-sided mydriasis or not is an important question, which unfortunately there seems to be no conclusive evidence to solve. I am bound to say that Beck, in his remarks on the above case, ascribes the mydriasis to pressure on the third nerve as it entered the cavernous sinus, though the post-mortem record hardly confirms it. It is an important fact that the compression mydriasis sometimes exceeds that due to complete paralysis of the third nerve due to other causes. Obviously, pressure on the trunk of the third nerve will not explain the numerous cases in which double mydriasis is present. Nor, reasoning from analogy in lower animals, will irritation of the superior frontal convolution (Ferrier) account for the others in which one-sided mydriasis is present, since the dilatation should be symmetrical and associated with other symptoms already mentioned. Probably pressure transmitted to the corpora quadrigemina must be taken as the explanation. This will explain why the mydriasis is found chiefly, but not solely, on the same side as the hæmorrhage, and will accord with the other paralytic symptoms. The explanation that the mydriasis is due to loss of sight from pressure on the visual centre, &c., will, I think, hardly agree with the facts. That the pressure occasionally produces irritation, and not paralysis of the pupil-centres, is probable from the two cases in which the pupils were in a state of fixed myosis (Mr. Cock's and Mr. Holthouse's).

(To be continued.)

REMARKS ON PROF. DEUTSCHMANN'S VIEWS ON OPTIC NEURITIS.

By Walter Edmunds, M.D., and J. B. Lawford, M.D.

In the last number of the "Ophthalmic Review" appeared an abstract ot Professor Deutschmann's valuable monograph "On Optic Neuritis and its connection with Brain Diseases."

Regarding the optic neuritis which occurs in cases of cerebral tumour and tubercular meningitis, Deutschmann from experiments on lower animals supports Leber's theory* that the cause of the inflammation of the optic nerves is to be found in certain "irritating elements," which are carried from the neighbourhood of the tumour or the meninges, in the cerebro-spinal fluid, along the intersheath space to the distal end of the nerve, and there set up a neuritis which travels upwards towards the brain. This, which is entirely opposed to the commonly accepted ideas of a "descending neuritis," he endeavours to prove by injecting tubercular matter within the dura mater of animals, thus producing tubercular meningitis and optic neuritis.

If his theory be correct he should be able to show that if the animals be killed in the first few hours or days after inoculation no optic neuritis is present; that at a later stage inflammation confined to the bulbar end of the nerve is found, and that later still the whole length of the nerve is involved. But this he does not say; his statement is that the intra-cranial portion of the optic nerve was found normal, and the intra-orbital part altered, the inflammation being more marked near the eye than posteriorly; but this is not conclusive, for the normality of the intra-cranial portion of the nerves would not exclude the possibility of the inflammation found in the distal portion having descended by the meninges of the nerve, which he admits were found to be inflamed. As to the inflammation in the sheath space appearing more intense near the eye, this may be due to the sheath being looser at the anterior part of the nerve and consequently allowing more free exudation.

Further, these observations of Deutschmann are not in accord with what has been found in the human subject. Gowers, in the second edition of his "Medical

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* Internat. Med. Congress, 1881, Ophthal. Section.

Ophthalmoscopy," states that in all cases of optic neuritis in which he examined the nerves, he has found changes throughout their length. We have ourselves examined some forty cases, and in every case in which papillitis was seen during life there were inflammatory changes in the optic nerves in their entirety. In a few instances the inflammation was confined to the proximal part of the nerve, and in these the papilla, both to the ophthalmoscope and microscope, showed no changes, death having occurred before the inflammation had time to travel down the nerves as far as the papillæ. In two specimens recently prepared by longitudinal section, inflammatory change can be traced continuously from the optic foramen to the disc. It appears to us that in man at least the theory of a descending perineuritis and neuritis is more probable than that of an ascending inflammation, and has not yet been disproved.

Deutschmann proceeds to state that as regards the frequency of occurrence of papillitis in intra-cranial tumour, " the precise seat . . . of the tumour appears to make no difference." In an analysis* of ninety-six cases of fatal cerebral tumour we found that optic neuritis was present in eighty-six per cent. of the cases in which the new growth was situated in the basal ganglia or in the cerebellum, whereas in only forty-six per cent. of those cases where the tumour was at the convexity of the brain did neuritis occur, a sufficiently noticeable difference as to frequency.

Lastly, Deutschmann quotes the statistics of Annuske and Reich to show that " cases of tumour without optic neuritis are very uncommon;" against this, it is stated by Gowers that about twenty per cent. of cases of cerebral tumour do not have optic neuritis, and in the analysis referred to above we found about thirty per cent. of the cases recorded as free from papillitis.

* Ophth. Soc. Trans., Vol. IV., p. 172, 1884.

R. M. Gunn (London). On Sympathetic Inflammation of the Eyeball. *Roy. Lond. Ophth. Reports, Vol. II., Part* 1, 1886; *Part* 3, 1887.

The author records a series of forty-seven cases of sympathetic ophthalmitis observed at Moorfields during rather more than three years, the period of his house-surgeoncy to the hospital, together with notes by Dr. Brailey of the pathological examination of the exciting eyes after excision. He analyses the series with regard to various important questions. The results may be summarised as follows :—

Age.—The youngest patient was aged 4 years at the onset of the sympathethic disease, the oldest 79 years. Tabulation of the cases in periods of ten years shows no noteworthy difference in the relative frequency of the affection in different decades. To obtain further light on this question the author tabulated all the cases of accidental perforating injuries admitted as in-patients during the same period. This table shows that such accidents are very much more frequent in persons under 40 years of age than at later periods of life, and that even when the figures are corrected for the diminished number of persons living at the more advanced ages, the liability remains much greater under 40 years of age. In the next place a comparison is drawn between the frequency of accidents and the frequency of sympathetic inflammation in the different decades, and it appears that the injuries of elderly persons are followed by sympathetic inflammation in a much larger percentage of cases than are the injuries of young persons. The author points out that his cases are too few to afford precise inferences, and that they may have been to some extent exceptional in their nature, but at least they appear to indicate that there is no foundation for the common opinion that the young are especially liable to get sympathetic disease from injury.

Nature of the Primary Affection of the Exciting Eye.—Forty-four cases are referred to under this heading, the causes being grouped as accidental wounds, operations, and other causes. *A. Accidental Wounds.*—Penetrating wound of cornea, the iris being involved either in the injury or through prolapse, 6 cases; wound of ciliary region, 6 cases; rupture of ciliary region by blunt instrument, 3 cases; wound of sclera only,

1 case; wound probably penetrating anterior part of eye but its position not mentioned, 11 cases; total 27. *B. Operations.*—Cataract extraction, 6 cases, three of these being by Graefe's original linear incision, three by a modified incision; needling of opaque membrane after cataract extraction, 2 cases. In all the foregoing operation cases, either the iris was adherent to the cicatrix, or severe inflammation implicating the iris occurred during the after treatment; in two there was panophthalmitis, and in another much shrinking of the exciting eye before the sympathetic outbreak. Iridectomy for increased tension in a case of corneal ulcer, 1 case; iridodesis for artificial pupil in lamellar cataract, . case; Saemisch section for corneal abscess followed by prolapse of iris, 1 case; trephining of leucoma in partially shrunken eye, 1 case; total 12. *C. Other causes.*—Damage by old corneal ulceration, 4 cases; inflammation following poisoned fly-bite, 1 case.

Interval between Primary Affection of Exciting Eye and onset of Sympathetic Inflammation.—Three groups are made, viz., "short," in which the interval was less than one month; "moderate," in which it was at least one month and not more than one year; "long," in which it was more than one year. The shortest interval was about fourteen days, but this point must be considered doubtful: the sympathetic mischief followed a needle operation, but the extraction done three months earlier had been followed by infiltration of edges of wound, slow healing, and iritis. An interval of 3 weeks was noted in three cases, of 24 days in one case. In 4 of these five cases with short interval, the result to the sympathising eye was exceedingly bad. An interval varying between 1 month and 10 months was noted in twenty-eight cases; the liability to sympathetic inflammation would appear to be at its maximum between the second and fourth months after the primary affection of the exciting eye. Ten cases are mentioned in which the interval was long, viz., from 39 years to 2 years. In eight of these the exciting eye had been damaged by injury, in the other two by corneal ulceration. In several of these cases of long interval the exciting eye had become painful and inflamed shortly before the outbreak of sympathetic mischief; in others, and notably in one of 20 years interval, there was no recent pain or redness in the shrunken exciting eye.

Relation of Interval to Age at Date of Sympathetic Disease.—Very long intervals are obviously not to be met with in early life and are therefore proportionately more frequent at a later age. The tabulated cases are too few to establish any difference in the essential liability to a long or a short interval at different periods of life.

Relation of Interval to the Nature of the Primary Affection.—In two out of the four cases in which corneal ulceration was the primary disease the interval was very long. It was not long in any one of the operation cases. Here again, however, the number of cases is too small to establish a rule.

Character of the Sympathetic Inflammation.—Three groups are made, viz., "mild," "moderate," and "severe." In five cases the disease was mild, running a short course without very urgent subjective symptoms, and presenting no relapse; the ciliary injection slight, the posterior synechia yielding entirely or nearly so to atropine. In all these cases the exciting eye was excised soon after the outbreak of the sympathetic disease. Keratitis punctata was noticed in two of the five; it may perhaps have been present, though not noted, in the others. In more than half the total number the sympathetic inflammation was moderate, *i.e.*, prolonged, with marked tendency to relapses or remissions; the sympathising eye not becoming rapidly blind, but deteriorating with each exacerbation; the pain rarely very acute; vision being ultimately lost, however, in at least half of the cases. Keratitis punctata is, the author says, usually well marked, if not universal, in cases of this type. In fourteen cases the inflammation was acute and very severe, frequently with great and intractable pain, and rapidly leading to loss of sight. In the severest cases, keratitis punctata is, the author thinks, by no means constant.

Final Condition of Sympathising Eye.—Three groups are distinguished, viz., "good," when the eye retained at least two-thirds of normal vision; "moderate," when it was still useful, and could read at least the larger of Jaeger's test-types; "bad," when it could at most distinguish light from darkness. The final condition was good in the five mild cases above mentioned. It was moderate in twelve cases; in five of these, however, the patients were not long under observation. It was bad in at least twenty-five cases, *i.e.*, in more than one half, and possibly

in some others classed as moderate. Light perception was known to be lost in nine cases, and in six of these the eye was excised.

Character of the Sympathetic Inflammation and Result, in Relation to Age, to the Nature of the Primary Affection, and to the Interval.—The cases are tabulated with regard to the points indicated above. It would appear that the tendency to a severe type, and to a bad result, is greater at the extremes of life than in middle life; that the severe type is relatively the most frequent in operation cases; that it is not more frequent in cases of wounds of the ciliary region than in those of corneal wound with implication of iris; and that the degree of severity has little or no relation to the length of interval between the primary injury and the sympathetic outbreak. With regard to all these points, however, it must be borne in mind that a very precise inference cannot safely be drawn from this number of cases.

Final Condition of Exciting Eye.—In thirty-four cases, that is in about three-fourths of the whole number, the exciting eye was lost, and in thirty of these it was excised, either on account of pain in itself or of the sympathetic disease. In six cases the exciting eye retained useful vision, although in five of these the sympathising eye was lost, and in the sixth greatly damaged. In four of these the primary lesion was a cataract extraction; in each of the four the operated eye retained useful vision, viz., $\frac{20}{40}$, $\frac{20}{30}$, $\frac{20}{100}$, and $\frac{20}{200}$; while the sympathising eye was absolutely lost, and had to be excised on account of pain. With the exception of these four cases, in every instance of severe inflammation in the sympathising eye the exciting eye was lost. In three cases, and probably in a fourth, the exciting eye was lost from panophthalmitis, and in all these the sympathising eye suffered severely.

Effects of Treatment.—From an analysis of the measures employed in this series of cases the author concludes:—1. That it is well to employ mercurials in all cases during the acute stage from the commencement. 2. That when and while the inflammation is of a very severe type, treatment should be merely palliative, and no operative measures are warrantable. 3. That cases of moderate severity do best without operation for the first six months at least, but iridectomy

may be then attempted if the tension is plus and the iris *bombé*. If at the end of a year the tension is about normal, but the pupil excluded and occluded, improvement may be expected from a large iridectomy (when possible), with extraction of the lens, followed later by division of the lymph and opaque membrane with Weiss' scissors. Or the latter instrument may be used alone, part of the lens substance being removed at the time, and the rest left to absorption or subsequent curette evacuation if necessary.

Occurrence of Sympathetic Ophthalmitis after Excision.—In four cases the onset of the sympathetic disease was first observed subsequently to excision, but the actual sequence was not absolutely certain in any one of the four: the early stage of the inflammation, when it is of mild type, easily escapes observation, especially if the cornea and pupil be not carefully examined through a high + lens behind the ophthalmoscope.

In conclusion, the author draws attention to several points of special interest. The exciting eye was lost from panophthalmitis in three cases. In several cases there were complaints of pain beginning on the side of the exciting eye and travelling across the forehead to the opposite eyeball and temple. In one there was intense headache with sickness, such as is commonly met with in cases of intra-cranial disease with optic neuritis. An oscillating or jumping pupil was noted in one case previously to the outbreak of the inflammation. Such oscillation is, the author says, common in sympathetic irritation, being sometimes the most prominent warning; after responding promptly to light, the pupil dilates and contracts alternately at intervals of a second or less, a phenomenon common in a lesser degree in the asthenopia of hypermetropes, and in persons of nervous temperament, but especially noticeable in sympathetic irritation. In at least two cases the lymphatic glands of the cheek or neck became swollen during the ophthalmitis. In one case the iritis was accompanied by pus in the anterior chamber.

PAUL SCHUBERT (Nürnberg). The Position of the Head in Writing. *Von Graefe's Archiv.*, *XXXII.*, 1, *p.* 33.

This article is a plea for the introduction of perpendicular handwriting into schools in place of the current slanting hand. It consists of 82 pages, and has annexed four tables of the

results of various measurements of the position of the head, etc., and seventeen specimens of German handwriting, every century, from the 8th to the 18th inclusive, being represented.

The first point investigated was the inclination of the base line (the line joining the centres of the eyes) to the horizontal plane, termed angle v. This is regarded as positive when the right eye is the higher, negative when the left is so. There was measured at the same time the inclination of the edge of the table to the base line projected on the horizontal plane of the writing table (the table being always horizontal), the children being placed with their pelves and shoulders parallel to the table, and not allowed to bend their bodies to the left. Of course, their heads were left in perfect freedom.

This second angle represents the horizontal deviation of the base line from the edge of the table or desk, and is termed angle h, being positive when the right eye is the more advanced of the two, negative when the left.

Each of these angles was measured 1,201 times in all, and the results are given in Tables I. and II.

(*a*) Series I. 185 measurements; 113 children. Copy-book in the erect median position, handwriting perpendicular, the child not allowed to bend its body the least to the left. Average of angle v $+2{\cdot}8^\circ$, average of angle h $-1{\cdot}8^\circ$.

(*b*) Series II. 215 measurements; 107 children. Copy-book in erect median position, slight bending of body to the left not prevented, handwriting perpendicular. Average of angle v $+2{\cdot}7$, average of angle h $-6{\cdot}0^\circ$.

(*c*) Copy book in oblique median position, *i.e.*, with the lines sloping 30° upwards (or forwards) to the right, handwriting as the child chose, body not bent towards the left; 185 measurements, 113 children. Average of angle v $+5{\cdot}0^\circ$, average of angle h $+1{\cdot}2^\circ$.

(*d*) Same as (*c*), but bending of body to the left permitted; 215 measurements, 107 children. average of angle v $+9{\cdot}4^\circ$, average of angle h $-1{\cdot}0^\circ$.

(*e*) Series III. and IV. 143 measurements, 75 children. Copybook and writing as in (*c*) and (*d*). Average of angle v $+9{\cdot}4°$, average of angle h $-1{\cdot}9°$.

In 400 measurements with erect median copybook v averaged $+2{\cdot}8°$, and h averaged $-4{\cdot}0°$.

In 543 measurements with oblique median copybook v averaged $+7{\cdot}9°$, and h averaged $-0{\cdot}7°$.

(*f*) Position of copybook and type of handwriting at choice of child. Series II. 107 measurements, 107 children. Average of angle v $+8{\cdot}4°$, average of angle h $-15{\cdot}8°$.

(*g*) Same as (*f*). 151 measurements, 83 children. Average of angle v $+9{\cdot}5°$, average of angle h $-12{\cdot}8°$.

In (*f*) and (*g*) the average of v was $+9{\cdot}0°$, and of h $-13{\cdot}9°$.

The average slant of the copybook in (*f*) and (*g*) was $+17{\cdot}7°$. The angle v is found then to be much smaller in the erect median position with perpendicular writing than in any oblique position of copy, no matter what the handwriting.

If, however, the angle which the copy lines make with the base line projected on the horizontal plane of the desk be considered, the erect median position is seen to be still more desirable. In it the angle v averages $+2{\cdot}8°$, and the base line projection makes the small angle $-4°$ with the copy lines, cutting them from above downwards (or rather from before backwards), and from left to right.

In the oblique median position, h averages only $-0{\cdot}7°$, but the copy lines make an angle of $30°$ with the edge of desk, so that the projected base line makes an angle of more than $-30°$ with the copy lines. In this position angle v averages $+7{\cdot}9°$.

In the voluntary position (average $17{\cdot}7°$ of slant), angle h averages $-13{\cdot}9°$, so that the projected base line makes an angle of $-31{\cdot}6°$ with the copy lines. Angle v is here $+9{\cdot}0°$.

It is manifest, then, that the base line deviates least from the horizontal position when its projection on the plane of the horizon is nearly parallel to the copy lines, and the further this is from being the case the more the base line tends to dip towards the left.

Schubert has also measured the inclination of the visual plane to the horizon, *i.e.*, in his experiments, the surface of the desk. The average angle was 60·70°, the minimum 30°, the maximum 85°. The conclusion to be drawn from these figures, taken in conjunction with those found for the angles *v* and *h*, is that there is a tendency for the child when writing to get the lines in the visual plane, but it is incorrect to assume that this position is usually actually attained. This conclusion is commonly, though inaccurately, expressed by the statement that the writer strives to render his base line parallel to the copy lines. It is not the base line, but its projection in the visual plane upon the desk.

Schubert considers that the angle *h* depends upon the position of the copy book; when the letter in process of formation lies to the left of the median plane *h* is positive, when to the right *h* is negative, and in both cases the size of *h* increases the more sideways the fixation point is situated.

A further experiment shows that the mere fixation of an object in the lower portion of the field, either to the right or left side, produces no effect upon the angle *v*, so that it is evident that the almost invariable occurrence of a positive angle *v* in writing must depend upon something peculiar to that particular action. Schubert's conclusion, as to the angle *v*, is that it stands in direct relation to the size of the angle between the copy lines and the projected base line, and this latter varies not alone in proportion to the slant of the copy book, but also to its displacement towards the right side.

Berlin's statement (*Vide* O. R., Vol. II., p. 12) that in writing a child follows the copy line by moving its head (the two eyes keeping thus equi-distant from the point of fixation) is disputed by Schubert. The latter found the angle between the sagittal plane and the line drawn from the middle of the base line to the fixation point to vary between $-10°$ (fixation point to the left of the sagittal plane), and $+20°$ when the copy lay in erect median position. In this position the average angle was $-0·5$. In the slanting median position it varied from $-15°$ to $+20°$, averaging $+1·9°$. But in the erect dexter position it averaged $+11°$, was only once negative, and reached as much as $+35°$. Somewhat similarly in the oblique dexter position it was rarely negative, and averaged

$+ 10{\cdot}4°$. A further measurement of this angle at the beginning and end of a copy line made on 101 children gave an average of $+ 1{\cdot}2°$ at the beginning and $+ 14°$ at the end of the line.

The angle between the down strokes of the writing and a perpendicular to the edge of the desk in the plane of the copy book (angle f) was measured in 309 cases with oblique median position of copy. It averaged $+ 8{\cdot}2°$, *i.e.*, the writing showed a slight tendency to slope towards the right. In 275 of these same copy lines, the angle f was measured separately for the first and the last long downstroke of the line. For the first downstroke it was not infrequently negative, but averaged $+ 3{\cdot}5°$. For the last it was rarely negative, and averaged $+ 9{\cdot}8°$. From this is concluded that this angle depends upon the position of the hand, which always tends to draw the strokes towards the body of the writer. The average of angle f in 952 measurements in oblique median position was $+ 6{\cdot}8°$. A practical deduction from these figures is to use short copy lines.

From the three angles v, h, and f, Schubert calculates the angle between the down strokes and the base line—that is, the angle measured by Berlin (*Vide* O. R., Vol. II., p. 12). This angle, with erect median copybook, averaged slightly more than 90°, with oblique median book, and with book placed according to the child's choice, somewhat less than 90°. On the average of all positions 88°, but it varied between 55° and 120°. These results differ considerably from those obtained by Berlin, whose method of measuring the angle is condemned by Schubert as inaccurate.

Schubert finds that the eyes do not follow the motions of the pen in making down strokes of less than 10 mm. in length—at least in the children he examined belonging to the middle classes of the school.

The law so insisted on by Berlin of the rectangular crossing if the base line and the downstrokes is completely disproved of Schubert's observation is to be trusted. He found that after allowing a child to write at ease for some minutes, no reasonable change in the position of the head (by pressing it into a new position, and making the child keep it there) made the slightest alteration in the direction of the succeeding down-

strokes. Schubert holds that their direction depends not upon the base line, but upon the mechanism of the movements of the hand and arm.

As a practical conclusion to be drawn from his observations, Schubert lays down the rule that all children should be taught a perpendicular handwriting. Even if the erect median position of copy book be not actually better than the oblique median, still the teacher cannot tell when inspecting writing done at home what absurd position may have been adopted in writing it, if the child is permitted to write anything but perpendicular letters. These latter can only be executed in the erect median position. It may be possible for adults to write more rapidly a slanting than a perpendicular hand, but children are not required to write rapidly, but in a manner that does not tend to deform their vetebral columns or their eyes. In many countries now-a-days, and in times past, perpendicular handwriting alone obtains, and Schubert appends a series of facsimiles of German handwriting in every century from the 8th to the 18th inclusive. From this it is seen that slanting letters were not adopted to any extent until the 17th century.

W. Uhthoff (Berlin). Relation of Visual Acuity to Intensity of Illumination. *V. Graefe's Archiv., XXXII., 1., p.* 171.

A short review of the older and later literature is prefixed to this paper, from which it is manifest that by far the majority of authorities hold that no strict mathematical law obtains as to the relation investigated. Exceptions are Tobias Mayer (1754), Posch (1876), and Mandlesen (1880). Mayer asserts that the visual angle varies inversely and the acuity directly, as the sixth root of the illumination. He varied the illumination from 1 to 676. Posch concludes that acuity increases as the logarithm of the illumination, or that acuity increases arithmetically when illumination is increased geometrically. Posch, however, admits that this law only applies when illumination does not vary more than from 1 to 16. Mandlesen's position is that (the test object being unchanged) the product of the distances between the light and the object and the eye and the

object is constant. His illumination only varied from 1 to 64, and even in these limits Uhthoff considers that his position is not substantiated by his own observations.

Uhthoff's illumination varied as 1 to 360,000, and in some experiments as 1 to 3,600,000, the lowest acuity being V = 0·0015 (Snellen C C at 10 cm. distance). Both white and monochromatic light were employed. An examination of the curves constructed from the data obtained brings out the following points.

Acuity of vision (white light) increases rapidly with increased illumination at the lower degrees of illumination till a point is reached (Illumination = 4 candles at 1 metre's distance), after which acuity only increases very slowly, till at last no further increase of illumination produces any effect whatsoever.

Uhthoff's own highest acuity was reached at an illumination of 1,175 (1 candle at 6 metres' distance is taken as unity), and and that of the other observers tested occurred at about the same illumination.

The curve for yellow light closely follows that for white. Indeed, in some of the observers the highest acuity was reached with less illumination in yellow than in white light, and the acuity was generally higher.

The curve for red differs from that for white and yellow in showing a continuous ascent with the higher degrees of illumination, and with the lowest degrees no vision at all in red light, while white and yellow afforded as much as V = 0·01 to 0·07. Uhthoff believes this is not merely due to absolute diminution of the quantity of light in the red tests, but depends partly upon the quality of the light. As is known, Macé de Lépinay and Nicati have stated that visual acuity in different spectral lights depends altogether upon the light intensity of the different portions of the spectrum and not at all upon their colour. Uhthoff agrees in their conclusions so far as the higher degrees of illumination are concerned, but finds they do not apply to the lower degrees.

The curves for green and blue are very similar, but that for green rises continuously with the higher degrees of illumination (though more slowly than the red curve), and the acuity remains relatively low when compared with that in white,

yellow, and red light. With the lower degrees of illumination, the blue curve runs almost parallel to the green curve, but the acuity is lower; with the higher degrees it runs almost parallel to the abscisses, and the acuity, even with the highest illumination, remains very low. In fact, with blue light considerable changes in illumination make very slight alterations in acuity of vision—an observation in full accord with those of Macé de Lépinay and Nicati.

The individual differences of normal eyes are curious when tested by the lower degrees of illumination. For example: One person could decipher Snellen C C at 10 cm. with an illumination of 0·000276. This man had V = 0·0015 when the illumination was only the 4,260,000th part of that which brought his acuity to its highest point. Uhthoff's V = 0·0015 when the intensity was the 783.333rd part of that which produced his highest acuity, and yet Uhthoff's acuity was superior to that of the former, and increased more rapidly with increasing illumination.

The curves of a green-blind individual show an acuity with yellow light that remains below that with white light, while in normal eyes the acuity with the former is at least as good as, and sometimes higher than, that with the latter. In this case the red curve runs parallel with the white and yellow curves, and does not show the continuous ascent with high degrees of illumination. The green curve both in height and direction coincides almost entirely with the blue curve.

A completely colour-blind hemeralopic* man was also tested. His acuity was with lower degrees of illumination relatively high, but began to lessen from excess of light at a point at which the normal eyes had not yet attained to their highest acuity.

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THE PUPIL-SYMPTOMS MET WITH AFTER INJURIES TO THE HEAD, ETC.

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(Concluded from page 134.)

The Pupil in Cases of Lesion of the Cervical Sympathetic.—Having discussed, in the last two numbers of the "Ophthalmic Review" the pupil-symptoms met with in some cases of injury to the head, we have to notice those occurring after wounds, etc., of the neck, in which the "cervical splanchnic" has been involved. In man this nerve probably passes from the first or second dorsal nerve to join the cervical sympathetic cord, as shown in one of the following cases in which fracture of the upper three ribs was attended by paralytic myosis. In its course to the eye it was formerly assumed to pass through the lenticular ganglion, but of late some slight doubt has been thrown upon this.

Hansen and Völckers proved that in the dog and pig, after removal of the lenticular ganglion, irritation of the cervical sympathetic still produced dilatation of the pupil, hence in these animals it is plain that the ascending branch does not pass through the ganglion. Jessop has confirmed this with regard to the dog and cat (Erasmus Wilson Lectures, 1887). In the human subject, although the extreme tenuity of the nerves renders the statement perhaps somewhat uncertain, sympathetic fibres are said to reach the ganglion with the long root from the nasal, or "by several fine filaments, the majority of which accompany the third nerve" (Reichert).

Three ocular symptoms are to be referred to paralytic lesion of the cervical sympathetic, of which the first two are the most easily demonstrated : 1, inability of the pupil to dilate in a dim light (although it will still respond to atropine); 2, diminution in the vertical measurement of the palpebral fissure ; and 3, slight recession of the globe.

All these symptoms were illustrated by the two cases recorded by Hutchinson, in his "Clinical Illustrations" (Vol. I., p. 203), one of tearing of the roots of the brachial plexus, the other of an incised wound of the neck, in which the sympathetic was the only important structure implicated. The first of these is so well known that it is only necessary to recall that the condition was still present at the end of six years from the accident, and that at first there was thought to be some difference in the vascular supply to the head, i.e., the ear on the affected side was colder than on the other, and attacks of vertigo were attributed to imperfect vaso-motor control over the cerebral arteries on that side.

In the Ophth. Hosp. Reports, Vol V., p. 139, a case is briefly mentioned that occurred under the care of Dr. Frazer, in the London Hospital. A boy had received a severe contusion of the right side of the neck, and as a result the right pupil was smaller than the left one, especially in a dim light. The left ear was 2° warmer than the right.

A case of presumed rupture of the lower cords of the brachial plexus, with accompanying pupil-symptom, was under the care of Mr. James Adams, at the London Hospital, but I am unfortunately unable to trace the record of it. The following one is particularly note-worthy, from the upper cords being involved :—

Case 9.—James Stewart, aet. 30, was admitted under Mr. W. Tay into the London Hospital, on December 18th, 1883, having fallen some 12 feet, striking his head and face on the left side. He suffered severely from concussion, and bled freely from the left ear. There was also sub-conjunctival

hæmorrhage on this side. There was extensive extravasation, apparently under the left sterno-mastoid, in the neck; this fluctuated for a time and left, as the fluid part was absorbed, a vertical row of hard rounded bodies above the clavicle. Three years later these were still present, and from their position it was surmised that they might possibly be connected with the torn nerve-bundles. From the first it was noticed that the left pupil, whilst it contracted to light, only dilated very slightly when the stimulus was removed. In a good light they appeared to be equal (Mr. W. Tay), although other observations frequently record that the left was the smallest of the two.

The left deltoid, biceps, brachialis anticus, and coraco-brachialis, the flexors of the hand, and the supinator longus muscle were paralysed, and on January 10th showed the reaction of degeneration; the small muscles of the hand and its extensors retained a considerable amount of power. The area of skin supplied by the circumflex nerve, and the front of the upper arm were anæsthetic, and especially in the upper part showed no trace of sensation of heat or cold. The arm dropped helplessly to the side owing to the inability to flex it at the elbow, and on this account Mr. Tay had a leather case provided for him, which kept the elbow at a right angle, and enabled him to use the hand to a considerable extent.

Since the ulnar and musculo-spiral nerves escaped it is obvious that the injury involved not as usual the lower but the upper roots or cords of the brachial plexus, and it is probable that the "pupil inhibitor" nerve was damaged after it had left the spinal cord. The pupil symptoms very gradually passed off, and hence we may infer that the lesion was rather due to pressure by blood-clot than to actual tearing of the nerve.

Case 10.—The following interesting case, in which paralysis of one ocular sympathetic followed fracture of the upper ribs, occurred under the care of Mr. Treves.

H. B., aged 54, was crushed between a railway-engine and the wall, as a result of which the upper three ribs on the right side were fractured. When a strong light was thrown upon the eyes the pupils were equal, but on removing the light the right pupil dilated only to 3½ mm., the left to 4½ mm. On the right side the palpebral fissure was decidedly smaller than on the left, owing no doubt to paralysis of the Müllerian muscle,

but the relative protrusion of the eyes appeared to be about equal. These pupil symptoms continued until his discharge one month later. The effect of atropin and of cocain agreed with what one would expect from the results of Koller, Jessop, and others. On instilling a 5 per cent. solution of cocain the left pupil dilated, whilst the right remained the same size; atropin, however, caused it to dilate from 4 to 6 mm. I examined the fundi carefully and could detect no difference between the arteries of the two sides; pulsation could be just detected in both. The veins of the right disc were somewhat fuller than those of the left, but this was no doubt due to some anatomical difference.

Although in other cases of paralytic myosis no difference in size of the retinal vessels has been observed (see Dr. Wm. Ogle, Med. Chir. Trans., 1869, pp. 156 and 164), in rabbits section of the cervical sympathetic is said to be followed by considerable "congestion of the retina."

Case 11.—Wm. I., aet. 17, came under Mr. McCarthy's care, February 9th, 1886, for enlargement of both lobes of the thyroid gland, of several months' duration. The goitre was presumably cystic, and on one occasion rupture of one of the cysts appeared to take place, followed by considerable swelling, dyspnœa, and dysphagia, which disappeared on the application of cold for some few hours. As a rule the goitre interfered neither with breathing nor swallowing. The pupillary symptoms were obvious from his admission, and it would appear that the sympathetic branch of the left side was for some time paralysed by the pressure of the goitre, for the pupil remained practically motionless in all conditions of light at 3-4 mm. A fortnight after admission, when the goitre appeared to be rather smaller, the left pupil dilated to 5 mm. when shaded. On the other side it seemed that the sympathetic was irritated, as the right pupil was in rather dim light, 6½ mm., and contracted much less than the normal both to light and on accommodation.

M. de Wecker (Traité d'Ophthal., Vol. II., p. 372) records the case of a young man who had a large goitre which produced "very marked myosis on one side. As

the swelling decreased under treatment this symptom subsided to a considerable extent." He quotes from Wilbrand a case of unilateral myosis, due to pressure on the sympathetic by strumous glands, the patient also suffering from neuralgic pains in the arm of the same side. As the glandular mass decreased under treatment, the iris regained its power to dilate and the field of vision widened.

In the London Hospital Reports (Vol. I., p. 2) the late Dr. H. Davies narrates a case under his care of right subclavian aneurism, which produced contraction of the pupil; at any rate there was immobility when the eye was shaded. At the post-mortem examination it was found that "two of the larger cords of the cervical sympathetic were completely lost in the walls of the sac."

In the same volume of the L. H. Reports, p. 205, are briefly reported two similar cases, one in which the immobility of the pupil in dim light was due to a thoracic aneurism, the other to pressure of enlarged glands. In both these, as in so many other recorded cases, it is positively stated that the pupil on the affected side was contracted, but my father has pointed out ("Brain," Vol. I., p. 11, and elsewhere) that the usual condition is not contraction but inability to dilate, and the Plate xxxiv. of Clinical Illustrations well shows this. He states that in no one of the six cases of lesion of the cervical sympathetic that he had observed was the affected pupil much less than 4½ mm. in diameter. It may be doubted whether some of the cases referred to are not wrongly reported, although it would be unwise to affirm that no contraction on the side on which the sympathetic is involved can ever take place, especially since experimental section of the nerve is followed by "contraction of the pupil, not always very well marked" (Foster's Physiology). In Dr. Wm. Ogle's case (paralysis of cervical sympathetic and of brachial plexus, due to a gummatous abscess), although no measurements are

given it is stated that the affected pupil, when the patient looked towards the light, was scarcely more than half the other in size.

In the following case the "pupil inhibitor" nerves were paralysed on both sides, owing to a fracture-dislocation of the lower cervical spine, and in it we see the exact condition produced by uncontrolled action of the third nerve supply to the iris.

CASE 12.—Jas. R., aet. 34, was admitted under Mr. McCarthy in the London Hospital, after a fall backwards when going up stairs. Diaphragmatic breathing was well marked, and loss of motor and sensory power in the legs came on during the night. With other definite symptoms of compression of the cord there was partial paralysis of the left arm (extensor muscles), and the pupils were found not to dilate in a dim light. On the third day I noted "both pupils are in fairly bright illumination 2½ mm., and remain the same when the light is removed; with strong direct illumination they contract very slightly. Fundi normal." This state of the pupil lasted until his death. He died on the 9th day after admission, and it was found that the first dorsal vertebra had been displaced backwards, crushing the cord.

In Plate xxxiv. of the Clinical Illustrations (paralysis of left cervical sympathetic) the pupils are in direct illumination and during parallelism of the optical axes exactly equal, measuring 3-3½ mm., the patient being a man a few years older than the one just referred to. From these cases and others we may fairly conclude that when the contractor pupillæ is left free to act, by complete paralysis of the sympathetic supply to the iris, the contraction produced is slight, the pupil being in ordinary daylight and in adults from 2½-3½ mm.

To summarise the chief points noted in this paper:
1.—In most cases of concussion, for a variable time, depending on the severity of the injury, the state of the pupils resembles that met with in ordinary anæsthesia produced by ether, chloroform, etc., i.e., slowness to respond to light without marked myosis or mydriasis.

2.—In a small proportion of cases of concussion temporary mydriasis (uni- or bi-lateral) is met with.

3.—When inflammatory reaction follows severe bruising of the brain myosis is the rule.

4.—In compression of the brain, from meningeal hæmorrhage, mydriasis on the side of the lesion is met with in at least half the cases, double mydriasis occurring next in order of frequency, myosis being very rare. The pupil-symptom here is probably dependent on pressure on the corpora quadrigemina rather than on the trunk of the third nerve.

5.—In cases of injury to the cervical sympathetic active myosis does not occur, but the pupil on the side affected will not dilate in dull illumination.

6.—From the preceding cases the course of the "cervical splanchnic" in man appears to be the same as that proved experimentally in lower animals.

ABSTRACTS OF LECTURES ON THE INTRA-OCULAR MUSCLES OF MAMMALS AND BIRDS.

Delivered at the Royal College of Surgeons of England, February 18th, 1887.

By Walter H. Jessop, M.B., F.R.C.S.

Lecture II.

The following results were obtained chiefly by experiments on mammals—dogs, cats, or rabbits, and in some cases, specially stated, on birds—fowls, and pigeons.

The animals were always fully under the influence of an anæsthetic if the experiments were made during life. The action of the pupillary muscle was chiefly gauged by alterations in the size of the pupil, and that of the ciliary muscle by movements of the image on the anterior surface of the lens. The subject is divided into experiments on (1) the muscular tissue, (2) the nerves, (3) the blood supply of the muscles.

I.—*Muscular Tissue.— Pupillary Muscle.*— Direct stimulation of the muscle near the pupillary border of the iris is followed by contraction of the pupil ; this result follows if the third nerve be cut, or even if the eyeball be exsected. If the iris itself be removed carefully from the eye, such stimulation still gives rise to myosis. On placing electrodes on opposite sides of the periphery of the cornea the passage of an electric current is followed by mydriasis. Grünhagen showed that on suspending the iris and stimulating its periphery, dilatation of the pupil ensued

II.—*Nerves.*—(A.) *Nerves to Pupillary Muscle.*—The Short Ciliary or Myotic Nerves may be considered physiologically as branches of the third nerve through the lenticular ganglion ; it will be therefore convenient to start with the experiments on the trunk of the third nerve.

On exposing and dividing the third nerve in the cranial cavity the pupil dilates moderately, and does not act to light or the movements of accommodation. On stimulating the distal end of the cut third nerve the pupil contracts.

On exposing the lenticular ganglion from the outer side of the orbit, and exsecting it, the pupil dilates more (Franck) than on mere section of the third nerve, because the tonic action of the ganglion is lost.

If the short ciliary nerves be detached from the lenticular ganglion experiments may be made on one or more. If all these nerves be stimulated together complete myosis occurs, and this may also happen if only one be stimulated, provided that the pupil is small. If, however, the pupil be large, stimulation of one nerve gives rise to partial and irregular contraction of the pupil ; this is well seen in an eye under cocaine. On section of only one or two of the short ciliary nerves the pupil dilates as a rule irregularly, and on now stimulating the third nerve the pupil contracts in the part not dilated.

After exsection of the lenticular ganglion or section of all the short ciliary nerves, stimulation of the third nerve has no effect on the pupil.

These experiments give the same results in birds.

The Long Ciliary or Mydriatic Nerves, though branches of the nasal nerve, transmit impulses from the cervical splanchnics, and the experiments on these latter nerves will be considered first.

It is necessary in experimenting on these nerves to distinguish between the bilateral mydriasis following irritation of a sensory nerve, and the mydriasis occurring only on the same side as the nerve stimulated.

On exposing the anterior roots of the cervical and upper dorsal nerves in the dog it is found that only stimulation of the second dorsal gives rise to marked dilatation of the pupil of the same side, and section of it produces myosis. Ferrier has noted the same result in the monkey, and from pathological evidence it is probably the same nerve in man. Franck traces the mydriatic fibres along the anterior strands of the annulus vieussennii, and says that the posterior fibres are only vaso-motor.

On section of the cervical splanchnics between the superior and inferior cervical ganglia myosis occurs, and stimulation now of the second dorsal nerve has no effect on the pupil, though excitation of the distal end of the cervical splanchnics gives rise to complete dilatation of the pupil.

On ablation of the superior cervical ganglion, a greater myosis ensues than on mere section of the cervical splanchnics below it, and on now stimulating the second dorsal nerve or the cervical splanchnics below the ganglion, no effect is produced on the pupil.

Franck was enabled to trace a nerve from the superior cervical ganglion through the petrous portion of the temporal bone, and on stimulating it to produce complete dilatation of the pupil.

If the trigeminus be divided behind the gasserian ganglion, excitation of the cervical splanchnics gives rise to complete mydriasis; on section, however, of the trigeminus in front of the gasserian ganglion, stimulation of these nerves has no effect on the pupil.

On cutting all the long ciliary nerves, stimulation or section of the cervical splanchnics has no effect on the pupil; if, however, one or more of the long ciliary nerves be not cut, excitation of the cervical splanchnics gives rise generally to irregular dilatation of the pupil, and section of these nerves produces a regular pupil if irregular before.

The cervical splanchnics contain vaso-motor fibres besides mydriatic, and that the dilatation of the pupil following excitation of these nerves is not due to constriction of the blood vessels is evident from the following facts:—

On bleeding an animal rapidly to death, and then several times stimulating the cervical splanchnics to make sure of emptying the blood vessels of the iris, it is found that on again stimulating these nerves complete mydriasis occurs. The dilatation of the pupil always precedes the contraction of the carotid vessels; the maximum dilatation of the pupil is reached before the carotids are completely constricted; the carotid vessels are constricted when the pupil begins again to contract; the pupil is dilated only for a short time, while the carotids are constricted for a longer time; the constriction of the pupil is complete when the relaxation of the vessels is not completed.

The effect of the trigeminus on the pupil has been differently recorded by observers. On division of the trigeminus in the cranium myosis ensues, which in rabbits lasts a very short time. Stimulation of the cut distal end of the trigeminus gives rise often to myosis, but this is probably reflex, as on section first of the third nerve on the same side Franck and the lecturer have seen mydriasis ensue on such stimulation. Balogh also attributes a mydriatic influence to the trigeminus.

Experiments on the long ciliary nerves show that excitation of one nerve may give rise to complete or to only partial mydriasis, and these differences depend probably on the previous size of the pupil. If the long ciliary nerves be exposed, and pilocarpine be instilled into the eye of the side operated on, stimulation of one nerve may at first give rise to complete dilatation of the pupil, but as the pupil is affected by the drug only one half of the pupil will respond, and later only one quarter.

In birds the trigeminus and long ciliary nerves have a mydriatic action, but the sympathetic apparently has no action on the pupil.

(B.) *Nerves to Ciliary Muscle.*—Short Ciliary Nerves. —On stimulating the trunk of the third nerve contraction of the ciliary muscle ensues. If the third nerve be divided, paralysis of accommodation occurs.

On section of the short ciliary nerves or exsection of the lenticular ganglion stimulation of the third nerve has no effect on the ciliary muscle. On stimulating the short ciliary nerves contraction of the ciliary muscle takes place.

If the long ciliary nerves be cut excitation of the trunk of the third nerve or of the short ciliary nerves gives rise to contraction of the ciliary muscle.

Long Ciliary Nerves.—The cervical splanchnics have no effect on the ciliary muscle, as may be seen by stimulating them at different parts of their course. On stimulating, however, the long ciliary nerves, if the ciliary muscle be moderately contracted, relaxation of the muscle occurs. This is best observed by performing a large iridectomy some days before. A weak solution of pilocarpine is now instilled into the eye, and on then stimulating the long ciliary nerves the image on the anterior surface of the lens will be seen to recede, proving relaxation of accommodation. The experiment may also be done by first exposing the cervical splanchnics, and the long ciliary nerves, and then

instilling into the eye a weak solution of pilocarpine. On now stimulating the cervical splanchnics the pupil dilates, and on also exciting the long ciliary nerves the flattening of the lens may be seen.

The origin of the fibres of the long ciliary nerves to the ciliary muscle has not yet been found out.

III.—*Blood Supply.*—Stimulation of the cervical splanchnics gives rise to constriction of the blood vessels of the eyeball, and section of these nerves to dilatation of the vessels; the same effects follow similar experiments on the trigeminus. As constriction of the arteries or a bloodless condition of the eye produces dilatation of the pupil, and an engorged state of the vessels contraction of the pupil, it is necessary to eliminate this source of error in these experiments. The proof that the state of the vessels does not produce any of the results mentioned in the preceding sections is that the same results are obtained in animals bled to death.

The foregoing experiments prove that in mammals and birds the pupillary muscle is supplied by the short ciliary nerves producing constriction of the pupil, and by the long ciliary nerves producing dilatation. In mammals also the short ciliary nerves induce contraction of the ciliary muscle, and the long ciliary nerves relaxation. These facts correlate the unstriped intra-ocular muscles of mammals with the involuntary muscular fibre of the heart, blood vessels, intestines, &c.

HEDDÆUS (Halle). The Reaction of the Pupil to Light: its Observation, Measurement, and Clinical Signification (*pp.* 79). *Bergmann*, *Wiesbaden*, 1886.

Heddæus asserts that the observations and records of the state of the pupil, especially on the part of neurologists, are extremely imperfect, and this he attributes partly to want of uniformity in the mode of observation, partly to the clumsiness and ambiguity of our nomenclature. In this last relation he

recommends the uniform use of the terms "direct" and "consensual," the first to express the movement of the iris caused by variation in the amount of light falling on the retina of the eye in question, the second to express the movement produced in the opposite eye by that variation. The term "immobility of pupil" he would apply only to the pupil which has neither the direct nor consensual reaction to light, nor the accommodative reaction. Excluding for the moment the reflex centre, it may be said that this condition of immobility implies disease of the centrifugal pupillary fibres. When the accommodative reaction is absent, the light reaction will also almost invariably be lost. For the reaction of the pupil to light he suggests the terms "reflex sensibility" and "reflex insensibility" (Reflexempfindlichkeit, Reflextaubheit). Reflex insensibility of the eye, or what is the same thing if the media are proved clear, reflex insensibility of the retina, implies disease of the centripetal pupillary fibres.

The methods recommended by Heddæus for testing the pupillary reflex do not differ essentially from those employed by most careful ophthalmic surgeons, but as there is probably some ground for his reproach in the case of neurologists we may enumerate them. In the simplest method, the patient stands about four feet from a window looking out into the distance. The observer covers the left eye with his right hand for five to ten seconds, meanwhile watching the right eye. He now uncovers the left eye and estimates the consensual reaction of the right eye. Again covering and uncovering the left eye he observes the direct reaction of the left eye. He repeats these actions for the right eye. To exclude possible accommodative reaction we must see that there is no convergence, and also if the pause or latent period of the reflex, about 0.5 second, takes place. The pupil contracts to its minimum size with a jerk, widens slightly, and ultimately settles to its final size. If the reaction by this method be doubtful, Heddæus next partly covers the right eye until he can just see the outline of the pupil. He, at the same time, completely covers the left eye, and keeps both eyes thus covered for about a minute. Now uncovering the left eye he watches the consensual reaction of the right eye and the direct reaction of the left. If the reaction is still doubtful he sends the patient to the dark room for a

quarter of an hour, the second eye is completely covered or bandaged, and the first is then suddenly exposed to the full daylight. For testing the reaction of different parts of the retina as in hemianopia, the dark room and lamplight reflected into the eye with the ophthalmoscope must be employed. Heddæus has not satisfied himself of any difference in the reaction of the two halves of the retina in such cases.

In discussing the equality and inequality of the pupils—Isocoria and Anisocoria—Heddæus quotes Baumeister's case (Archiv. für Ophthal., XIX., 2., pp. 272—274), as the solitary recorded instance of anisocoria resulting from difference in the amount of light falling on the two eyes. The case was that of a girl, aged 21 years, totally blind from birth, with small eyeballs, nystagmus and optic atrophy. Media clear. Each pupil in ordinary daylight measured 3½ mm. Short exclusion of light caused no reaction, but if both eyes were covered for one minute the pupils widened to 5 mm. The contraction on exposure was also very slow, requiring fifteen to twenty seconds. If one eye was excluded from light its pupil widened without trace of consensual movement in the opposite eye. Atropine and eserine produced their usual actions.

In anisocoria it is frequently difficult, sometimes impossible, to say which is the pathological eye. If it arises from oculomotor paralysis it will be most noticeable in bright light; if from oculo-motor irritation in dim light; and if a unilateral narrowing persist in bright sunlight, it is probably caused by paralysis of the sympathetic. The actions of cocaine, eserine, and atropine will often assist in a decision.

Heddæus measured, by what he calls his "combined method." the pupils of 172 scholars, and he records the results, with the ages, refraction, vision, and colour of irides in much detail. His combined method gives three values for each pupil. The person observed covers his right eye with a handkerchief. The observer then excludes the light from the left eye, and measures the width of the pupil with as little light as possible. This maximum width he calls *a*. The left eye is now exposed, and its ultimate width forms the second value *b*. Lastly, the observed uncovers his right eye, and the final width of the left pupil forms the third value *c*. From his results Heddæus deduces the law of diminution in the size of the

pupil with age. The pupil which has now a width of a will after n years be $a \times 0{\cdot}99^n$, *i.e.*, a pupil measuring 5·1 mm. at 12 years will measure 4·1 mm. at 32, 3·4 at 52, and 2·8 at 72. His results, combined with those of Schadow, show that there is no real sluggishness in the pupillary reaction in age. The apparent difference is due, Heddæus holds along with Michel, merely to (1) the diminution in size of the pupil, and (2) to the diminution of the light stimulus from this diminution in size. It has been asserted that the strain of accommodation in hypermetropes, and its relaxation in myopes, gives to the first a narrow, to the second a wide pupil. Heddæus' results show that there is no relation between refraction and size of pupil. The difference in colour of the irides examined was too small to allow of any conclusion being drawn.

The last part of Heddæus' monograph is occupied with an inquiry as to the course of the centripetal pupillary fibres. In considering this question he lays down that normally the pupils are equal, whatever difference there may be in the amount of light falling on them. In the case of unilateral reflex insensibility with amaurosis, anisocoria is much more frequent than isocoria, but there are cases, and he quotes four, where even, though of long standing, the pupils were equal. Anisocoria is in such cases, therefore, by no means a necessary result, and Heddæus says that when it is considered how much the centrifugal pupillary nerves, III., V., and sympathetic, are exposed to injury, it is little wonder that anisocoria is so frequent in amaurosis with reflex insensibility. Again, in cases of unilateral cataract where the pupil is dilated, we have frequently a manifest reason for the dilatation, *e.g.*, increased ocular tension, mechanical pressure by the swollen lens on the iris, lesion of the ciliary nerves in traumatic cataract.

He next asks what grounds there are for believing that all the fibres in the optic nerve do not serve for vision, but that some are concerned in reflex action. Stilling and Gudden have asserted that it is so, and Gudden even asserts that the two groups of fibres are microscopically distinct, the visual fibres being smaller than the pupillary, and becoming atrophied on destruction of an anterior corpus quadrigeminum, while both the pupillary fibres and the pupillary width and reaction are unaltered. On the clinical

side of the case there are two groups of cases to be considered, (1) Amaurosis without reflex insensibility, and (2) reflex insensibility without amaurosis. That the pupillary reaction to light may persist in bilateral total blindness has been known for some time, and von Graefe's explanation is generally accepted, that in such cases the cause of the loss of vision lies centrally from the point of divergence of the pupillary fibres. But sometimes the ophthalmoscope shows optic atrophy, and yet reflex sensibility persists. Here comes in the difficulty of diagnosing the degree of atrophy. In such cases it may be supposed that the nerve, although much damaged, is yet able to convey the light stimulus, but that behind the point where the pupillary fibres leave, the damage is so great as to destroy vision. A test case would be the retention of reflex sensibility where there was total amaurosis of one eye and good vision of the other. Heddæus considers that it is doubtful if such a case has really occurred, and he shows by the record of cases how readily the diagnosis of total amaurosis may be reached on inadequate grounds. On the other hand, the cases recorded by him make it certain that reflex sensibility is more easily induced than is light perception. The former was comparatively easy to induce, the latter difficult. This may be due, he says, either to the fact that the pupillary reaction is a finer test for light than light perception, or that the centripetal pupillary fibres, if such there be, are more resistant to pathological processes than are the visual fibres. He does not attempt to decide the point.

In deciding as to the presence and position of centripetal pupillary fibres it is clear that cases of reflex insensibility without amaurosis are extremely important. Heddæus records a case (probably hæmorrhage involving the nerve at the optic foramen) where, after temporary complete amaurosis and reflex insensibility, excentric vision was recovered without recovery of reflex sensibility From this and other cases Heddæus concludes that reflex sensibility is confined to the macular region. In support of his conclusion he adduces the following facts :—(1) In deeply pigmented normal-eyed people illumination of the peripheral parts of the retina may produce absolutely no pupillary reaction. (2) In unilateral mature cataract direct illumination with the ophthalmoscope of the macular region

shows reflex sensibility as higher in the sound eye, while lateral illumination shows it as higher in the cataractous eye. The result in the latter case he believes to be due to the diffusion caused by the lens opacity. If Heddæus' assumption be correct, it follows that in hemianopia there would be no difference in the pupillary reaction of the blind and the functional halves of the retinæ, and this, in opposition to Wilbrandt, he asserts to be the case. Total reflex insensibility from central retinal affections he has never seen, but he has seen it much diminished in central hæmorrhages, &c. He does not discuss the pupillary condition in tobacco amblyopia or in tabes.

Summing up, then, Heddæus considers that it is probable that there are special centripetal pupillary fibres, that these run in the optic nerve with the macular fibres, and that the pupillary fibres are more resistant to pathological processes than the visual. Also he agrees with Bechterew that these fibres probably do not pass into the optic tracts, and do not decussate in the chiasma, but pass back behind the chiasma directly into the grey matter surrounding the third ventricle, and so reach the oculo-motor nucleus of their own side. From this it would follow that dilatation of the third ventricle would cause dilatation of both pupils, and that unilateral destruction of the grey matter in the wall of the third ventricle would cause reflex insensibility on the same side. Of this he gives some evidence. He does not discuss pupillary change from disease of the pupillary reflex centre.

Birnbacher and Czermak (Graz). Anatomy Pathology of Glaucoma. *V. Graefe's Archives, XXXII., 2, p. 1 and 4, p. 1.*

These articles contain an admirable account of the pathological anatomy of seven glaucomatous eyeballs; five "chronic inflammatory," of which one had retinal hæmorrhages, and two "glaucomatous degeneration." This description is followed by a dissertation upon the nature and extent of the observed tissue changes, special attention being given to the excavation of the disc and scleral ectasia, and an account is added of some experiments upon the intra-ocular circulation and pressure.

The pathological appearances common to the whole seven cases consist of a chronic inflammation of the whole uveal tract, implicating also the anterior segment of the sclerotic, and the endothelium of the iris-surface (the iris stroma being commonly less affected), peripheral surface-synechia and ectropium of the pupillary border, inflammation in and round one or more vortex veins, with obstruction in the lumen of the vessels, post inflammatory degeneration of some ciliary nerves, inflammation of the sclero-choroidal vascular circle extending to the optic nerve sheath, retinal atrophy, excavation of the papilla, and ectasia of the lamina cribrosa.

The author's commentary upon the foregoing pathological appearances is to the following purport :—

Cornea.—The changes are due to two causes, which may or may not coexist, viz., inflammation, which produces the pannus and parenchymatous keratitis, and obstruction (Stauung), which produces the œdema, the epithelial defects, and the keratitis bulbosa. The œdema cannot be regarded as the effect of local inflammation, as the latter is found less frequently and is less intense than the former. It is to be attributed to an increased transudation from the capillaries of the corneal loops. The bulbæ are signs of trophic changes in the epithelium due to lesions in the corresponding nerves.

Conjunctiva Episclera and Sclera.—The relations between the œdema and inflammation are the same as those ascribed to the similar processes in the cornea.

Canal of Schlemm, Ligamentum Pectinatum, and Iris-root.—The peripheral synechia are always to be regarded as the result of an adhesive inflammation at the angle of the anterior chamber, and are not simply the result of the iris being pressed against the posterior surface of the cornea. The presence of newly-organised tissue between the cornea and iris in nearly all the cases is of itself sufficient to establish this position. These synechiæ are produced by a chronic inflammation, with a tendency to cell proliferation and formation of granulation tissue, or by an originally acute inflammation which has taken on chronic action. Round Schlemm's canal are also found inflammatory products, which may be regarded as part effects of the inflammation observed in different degrees in the whole uveal tract.

Ciliary Muscle.—The changes in shape are principally due to a simple atrophy of the muscle, but the obliteration of the anterior angle may be partly caused by a dragging forward of its scleral origin, which results from the high tension of the globe. The tension produces this effect by its tendency to render the globe more spherical. The atrophy is partly due to nerve degeneration, and partly to loss of nutrition, principally caused by the contraction of the vortex veins.

Iris.—The peripheral synechiæ have already been attributed to an inflammatory origin, and the same holds good of the ectropium of the pupillary border, which results from the contraction of the cicatricial tissue formed by the proliferation of the endothelium on the iris surface. The atrophy of the iris tissue itself is the result of defective nutrition occasioned by the destruction of blood-vessels and nerves in the adherent portions of the iris root, and is not a simple pressure atrophy. If the latter view were sound, the atrophy would be evenly distributed over the whole iris, which is by no means the case. The iris blood-vessels are either normal or exhibit moderate thickening of the tunica adventitia. True hyaline degeneration is nowhere visible in iris or retina, and therefore cannot be regarded as the cause of high pressure. The loss of endothelial lining observed in one of the cases of the series is a purely atrophic phenomenon. The sphincter iridis is probably atrophied as the result of a trophoneurosis. The circulus arteriosus major exhibits no enlargement of the lumina or thinning of the walls of the vessels as described by Brailey.

The abnormal pigmentation found in the anterior segment of the globe generally is a migration of retinal pigment, which precedes in point of time the closure of the space of Fontana by peripheral synechiæ. The pigment is not a blood product.

The dimensions of the crystalline lens are always normal.

The Chorioid exhibits both inflammatory and atrophic changes, the former chiefly in the equatorial region, originating in the external layers of the tunic, and only subsequently invading the chorio capillaris. The most remarkable of all the appearances is the periphletitis and endophletitis observed in the vortex veins, the latter process being probably a result of the former, and producing in some cases actual obliteration

of the vessel. This occurs without the formation of a thrombus, for which, according to the latest experiments, two things are necessary, retardation of the blood current, and defect in the endothelium of the vessel. In the glaucoma cases only the former condition is present. The changes in the vortex veins cannot be regarded as "secondary" to the raised intra-ocular pressure; they are secondary to the chorioidal inflammation.

The Ciliary Nerves exhibit not infrequent atrophy. *The Sclera* shows signs both of inflammation and of atrophy, the former certainly in most cases an extension of the chorioidal inflammation, and the latter a natural result of the high tension.

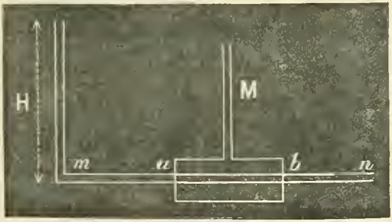
The Retina and Vitreous present changes natural to chronic uveal affections.

Considerable space is devoted to proving that the staphylomata and the ectasia of the lamina cribrosa are pure pressure effects. The histological examination of staphylomata shows us that the process begins by a rupture or tear of the most internal layers of the protrusion. This rupture may begin in the sclerotica, the cavity being then bridged over by the uvea, but if inflammatory adhesions have already formed between the uvea and sclerotica, the former then forms the inner layer of the staphyloma, and is the first to exhibit the rupture.

As regards the excavation of the papilla, attention is directed to the fact that the innermost layers of the lamina cribrosa must be more stretched than the more external ones as they endure most of the pressure, and they are accordingly the thinnest. The general stretching of the layers of the lamina widens their meshes on the one hand, but on the other hand destroys the correspondence between the openings in the different layers so that the nerves are dragged and bent in their progress through the lamina. In addition, the nerve fibres are stretched by the general ectasia of the lamina, the elongation of the nerve fibres being greater the more central their passage through the lamina. The stretching of the nerve fibres is regarded as a quite sufficient cause to account for their atrophy in glaucoma, and the proliferation of the connective tissue in the optic nerve is secondary to this atrophy of the nervous

tissue. The authors, however, consider it probable that the chronic uveitis frequently spreads along the vessels of the sclero-chorioidal vascular ring to the pial sheath of the nerve, and thence sometimes to the sheaths of the central vessels.

The second paper treats of the interchange of fluids between the vessels and the tissues, and of the pressure of the fluid contained in the tissues of the globe. Our authors start from the principle that the circulation of blood in the eyeball depends upon two factors; first, the general mechanism which regulates the circulation in the rest of the body (vasomotor nerves); and secondly, the intraocular pressure, *i.e.*, the pressure of the fluid in the tissues in the interior of the globe; and accordingly proceed first to investigate the physical laws which govern the passage of fluids in general through tubes presenting in part of their course permeable and moveable walls which permit the accumulation of transposed fluid around the tubes. The experiments are a repetition and extension of those of Körner upon transfusion in the capillary system. The apparatus used consisted essentially of a supply pipe and a



discharge pipe, connected through an intermediate portion, which admitted of transudation into a chamber furnished with a manometer. This chamber may be termed "the tissue chamber." The figure in the test will render the experiments more intelligible. *m n* is a horizontal tube of small diameter. At *m* a continuous stream of water is supplied under the constant pressure H. A free exit is given at *n*. *m a* and *b n* are watertight: *a b*, on the contrary, admits of transudation or filtration. This portion (*a b*) is surrounded by a closed vessel to which the manometer M is attached.

If now water is allowed to flow through this tube under a constant pressure the following remarkable phenomenon is observed :—The quantity of water escaping at *n* in a given time is found to decrease steadily, until after a variable time the flow ceases entirely. Meanwhile the fluid in the manometer M rises at first quickly, then more slowly, and finally, quickly again, and by jerks. During this time the membranous tube becomes narrower towards its distal extremity (next to the outflow pipe), and its walls fall gradually into an oscillating movement which, at last, ends in a complete stoppage in the form of a stricture. The proximal end, on the contrary, becomes dilated.

When the flow ceases it can be restored by increasing the pressure in the supply pipe, but only for a short time. Aspiration at *n* produces no effect except to expedite the process of stricture. No matter how low the pressure may be, so long as it produces a flow in a definite direction, it leads, though after a longer time, to the same result of stricture.

To produce a constant flow of water through this apparatus it is necessary to provide an outflow for the fluid in the tissue chamber, so as to prevent its pressure rising above that of the water in the distal portion of the membranous tube *a b*, and the outflow provided must be of a certain extent or stoppage will occur all the same though after a longer time. The conclusion which Körner drew from this experiment was, that every tissue which obtains its fluid contents from capillaries requires, in order to preserve the blood current, other channels for the escape of the contained fluid, viz., lymph vessels.

It occurred to Birnbacher and Czermak that the ocular circulation admits of another adjustment to effect the same end, and they modified the apparatus described by inserting a piece of spiral wire into the membranous tube so as to prevent its walls from collapsing. With this arrangement a constant current was easily maintained, and during its flow the proximal end of the tube was observed to be lifted up from the contained wire by the pressure of the water inside, while the distal end was closely applied to the wire by the pressure of the fluid in the tissue chamber. It is evident that during this experiment

transudation must take place from the tube into the tissue chamber at the proximal end of the tube, and from the tissue chamber into the tube at its distal extremity.

By applying stopcocks to the supply and discharge pipes the apparatus could be adjusted so that the proximal half of the membranous tube was raised up from the wire, and the distal half pressed down on it. If, then, the discharge pipe was gradually narrowed, the internal pressure rose until at last the whole of the tube was lifted up from the wire by the time that the discharge was completely cut off. By diminishing the supply pipe a larger portion of the tube gradually applied itself to the wire, until it all became applied simultaneously, with complete occlusion of the pipe.

In applying the results obtained in this experiment to the circulation in the eyeball the following anatomical arrangements of the blood vessels and lymph spaces are of importance:— The veins of the iris and ciliary body open into the venæ vorticosæ, except a few veins in the anterior portion of the ciliary muscle, which make their way into the episcleral veins and anastomose with the plexus venosus (Schlemm). These have no anastomoses with the chorioidal veins. The space in which this plexus venosus lies communicates with the anterior chamber through the spaces of Fontana. The wall of this plexus is so supported that it remains permanently open. Indeed, it is only by such a supposition that we can explain the rapid passage into it of coloured injections from the anterior chamber of dead eyes. The venæ vorticosæ unite into large ampullæ, which lie close to the scleral emissaries (*Vide* Fuchs, O. R., Vol. IV., p. 143), and the venous trunk from the ampulla through the emissary is a relatively narrow vessel. The emissary is funnel-shaped at its commencement, and communicates freely with the supra-chorioidal space. The wall of the vein is partly adherent directly to that of the emissary, and partly joined to it by loose connective tissue.

From these anatomical facts we may conclude that there is a sudden and great diminution of pressure in the venous trunk as compared with that in the ampulla, owing to the sudden contraction of the lumen of the vessel. Consequently, the pressure in the ampulla is unusually high for a vein, and it is raised still higher by the unusual size of the chorioidal

capillaries. The exact pressure cannot be known, but it must be at least higher than that of the tissues of the globe, as otherwise the ampullæ would be compressed by the intraocular pressure. The conclusion may then be drawn that as the pressure in the venous trunk is relatively low, as its walls are guarded against collapse, and as the space surrounding it communicates freely with the interior of the globe, transudation must take place from the supra-chorioidal space into the vein as it passes into the emissary. A perfectly analogous arrangement exists at Schlemm's canal for the transudation of the aqueous into the plexus venosus.

Our authors reject Schwalbe's theory that the supra-chorioidal space is connected with Tenon's space by a peri-vascular lymph space in the scleral emissaries. They cannot find any such lymph path microscopically, and when they injected coloured fluids most carefully into the supra-chorioidal space the fluids always reached the exterior of the globe through the trunk of the vein itself, as their theory of the intra-ocular circulation would lead them to expect, and never in any instance by the side of the vein.

Further experiments were undertaken to ascertain the effect produced upon the pressure in the tissue chamber by diminishing the discharge pipe. A constant rise of pressure was found to take place, and, though this increase could be reduced by narrowing the supply pipe sufficiently to restore the original pressure to the fluid circulating through the membranous tube, it still remained higher than at the commencement of the experiment. This shows the effect of diminished (venous) outflow with constant (arterial) pressure. It is of course known that venous stasis does not produce an increase of blood pressure in the corresponding arteries, owing, as Cohnheim has stated, to the arterial tonus, but it is plain from the above experiment that the tonus must actually lower the arterial pressure below the normal if the pressure in the tissues is to be kept at its normal height.

The effect of widening the supply pipe is to increase the pressure in the tube and also in the tissue chamber; narrowing the supply pipe, on the contrary, lowers the pressure both in the tube and in the tissue chamber. Similar effects respectively

are produced by actual increase on diminution of the pressure at which the fluid is supplied without altering the actual diameter of the supply pipe.

Further experiments show that by lessening the permeability of the filter through which the fluid in the tissue chamber returned into the circulating tube, or by diminishing its surface, the pressure in the tissue chamber rises, while a more permeable filter or a larger filtering surface diminishes the pressure.

The results of all these experiments may be summed up by stating that the pressure in the tissue chamber depends upon the size and permeability of the filtering surfaces as well as upon the actual pressure in the tube. The tissue pressure rises with increase of surface or lessened resistance in filter No. 1 (transudation from tube to tissue chamber), or with decrease of surface or increased resistance in filter No. 2 (transudation from tissue chamber to tube). Conversely the tissue pressure falls with decreased surface or increased resistance in filter No. 1, or with increased surface or decreased resistance in filter No. 2. The only effect of opening a pipe (lymph vessel) in the tissue chamber is to reduce the tissue pressure to an amount proportionate to the new outflow. It is not until the tissue pressure is reduced below that in the posterior portion of the membranous tube that the return flow from the tissues into the tube ceases.

A further modification of the apparatus showed that narrowing of one vein alone raises the tissue pressure, and also the pressure in the arteries, but the pressure in the artery belonging to the narrowed vein rises much higher than that in the fellow artery. Here too the restoration of the original pressure in the supply pipe by narrowing its lumen fails to restore the original pressure to the tissue chamber.

Our authors regard Schultén's experiments upon the effects of the circulation upon the intraocular pressure as the most trustworthy of those performed on the living eye (*Vide* O. R., Vol. III., p. 370). It is shown by Schultén that increased blood supply, diminished vascular tonus, or lessened venous outflow all raise the intraocular pressure, while lessened blood supply and increased vascular tonus lower it. These experi-

ments are in complete harmony with those of our authors, and the natural conclusion is that the intraocular pressure is regulated by the mechanism described in the present paper.

The hypothesis that the blood pressure affects the intraocular pressure by the mere contraction or dilatation of the vessels (that is, by direct decrease or increase of the contained blood) and not through the process of filtration is untenable. The variations are too great to be accounted for by such an hypothesis, and are also of too permanent a character.

It is noteworthy, too, that precisely analogous arrangements exist in the cranium in the rigid walled sinuses of the dura mater, into which the cerebro-spinal fluid can filter by means of the Pacchionian bodies, there being no important lymph vessels to conduct this fluid by any other route.

Our authors have shown in the first part of their paper that the glaucomatous eyes examined by them exhibited conditions tending to raise the intraocular pressure in the narrowing of lumen in the emissaries of the vortex veins, the adhesive inflammation round the venous trunks, and the thickening of their walls. (The ligature of even one vein, as Schultén has shown, is enough to raise the pressure inside the globe by restricting the venous outflow.) Besides this restriction of the venous outflow the fluid of the tissues of the globe was prevented from escaping by the adhesive inflammation and thickening of the wall of the vein, and also by the obliteration of the angle of the anterior chamber.

The general conclusion of this highly instructive paper is that primary chronic inflammatory glaucoma is due (in some cases though possibly not in all) to anatomical changes produced by antecedent inflammation in the anterior portion of the uveal tract, which hinder the outflow of blood and more especially lymph from the eyeball, and accordingly elevate the intraocular pressure.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, MAY 5TH, 1887.

J. W. HULKE, F.R.S., President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

The President announced that Dr. Samelson, of Manchester, had presented a volume of letters of von Graefe to the Society.

Fatal Meningitis after Excision of a Suppurating Globe.—Mr. Lang.—Meningitis followed the excision of a suppurating globe, causing death within forty-eight hours. On *post-mortem* examination extensive suppurative meningitis was found.

Insertion of Artificial Globes into Tenon's Capsule after Excision of the Eye.—Mr. Lang.—The author had adopted this plan after finding Dr. Mules's operation for artificial vitreous unsatisfactory. The operation consisted in inserting a hollow globe of glass, celluloid, or silver, into Tenon's capsule, and then closing the capsule by a set of deep sutures, and the conjunctiva by a superficial set, both of silk; the deep ones were not removed. A horse-hair drain placed under the deep sutures and an iced pad to the lids prevented pain and swelling of the lids and conjunctiva. In sixteen cases not one had suppurated; this was probably due to the antiseptic precautions which were taken, namely, to irrigate the conjunctival sac before excising the eye, again after the excision, which brought Tenon's capsule plainly into view, and again when the operation was completed. He thought the operation had all the advantages of Dr. Mules's operation without its disadvantages.

The President had never met with a fatal case after excision of a suppurating globe. He asked whether extension of the inflammation was brought about by the application of a too firm compress. Fluids in the orbit might conceivably in this way be driven back. He thought it would be better to treat such a case as an ordinary wound, and leave the orbit quite free from pressure.

Mr. Nettleship remarked that the meningitis might have preceded or accompanied the suppuration of the eyeball, and asked whether there was any fever before the operation, or other

indication of similar significance. Mr. Brudenell Carter, referring to the original operation in the first case, said that Sir Wm. Bowman had thirty years ago condemned the extraction of the capsule of the lens from the eye as a cause of cyclitis. In operations on the eye he always soaked his instruments in alcohol, a useful precaution against septic infection, he believed. Following von Graefe, he never excised an eye in a case of suppuration.

Dr. Brailey was of opinion that evisceration was the best method for a suppurating eyeball. The occurrence of suppuration was, probably, not often due to inoculation with germs on instruments, but had more to do with the general condition of the patient. He thought there was less chance of spread of the suppuration to the meninges if the sclerotic were left.

Mr. Adams Frost confirmed what Mr. Lang had said in favour of his operation as compared with that of Dr. Mules. His own operation had not been so successful as Mr. Lang's. His plan was to unite the muscles with Tenon's capsule and the conjunctiva over the globe; the hæmorrhage was sometimes very troublesome. He thought that removal of the sclerotic was an additional safeguard.

Dr. Mules had had upwards of one hundred cases of evisceration without any cause for anxiety; the cases were kept in about twelve days. There had been no sympathetic disease, nor had there been any difficulty in cleaning out the interior of the globe.

Mr. Jessop thought that the capsule of Tenon would get worn away by the foreign body; the sclerotic (as in Dr. Mules's operation) was the only tissue in the body of sufficiently low vascularity to withstand the irritation of a foreign body.

Dr. Little said that he sometimes enucleated and sometimes eviscerated; the latter when he had good reason to believe that the back part of the eye was not involved in the disease. He did not use or advise the employment of an artificial vitreous for fear of irritation.

Mr. F. R. Cross said that evisceration was a not altogether successful operation, for it was uncertain whether a sinus or fistula might appear after the introduction of the artificial vitreous; secondly, the thin conjunctival membrane between the artificial vitreous and the glass eye would be sorely tried.

He concluded that the old operation was still the best, especially if some means could be devised to keep the lower eyelid firmly against the glass eye.

Dr. Brudenell Carter had performed Dr. Mules's operation about twenty-five times. He had seen difficulty arise from the wound not uniting properly, but thought it an excellent and safe operation.

Mr. Nettleship had performed Mr. Frost's operation five times; two had succeeded, but in one of these the globe had become displaced.

Mr. Lang, in reply, said the lens capsule in his first patient was very tough and quite loose, and required no force in its extraction. He did not believe in the absorption of soft tissue by a foreign body. Gaping of the wound was due to the use of too large a globe.

Night-Blindness.—Mr. Nettleship narrated four cases (in two families) of night-blindness of long standing, and apparently at present not increasing, in which a number of very small, scattered, white spots were present at and behind the equator of the fundus, evidently caused by deposit, not by atrophy. In none of them were there any of the appearances of common retinitis pigmentosa, though there was pigment disturbance of a somewhat different kind towards the periphery in some of them. The patients were grown-up girls.

Complete Self-Enucleation of Eyeball. — Mr. Mackinlay narrated a case in which a woman had wrenched out her left eye with a meat-hook. She was 39 years of age at the time, and had had several children in rapid succession. She was suckling a baby 3 months old, and had been much depressed for three or four days before the occurrence. The optic nerve had been snapped off close to the commissure. She made a rapid recovery, and had since given birth to a child without any unfavourable symptoms. The only case he knew of was one recorded by Mr. McHardy in the last volume of the Society's "Transactions."

Pigment changes in Fundus.—Messrs. Critchett and Juler showed two patients. The first had a peculiar dotted appearance of the fundus of the right eye, whether in the choroid or the retina they could not say, nor did they know whether it was congenital or not; there was no reason to think of syphilis;

in the other eye the vitreous was hazy. The second was a young woman, with a rare form of pigmentary change in the retina.

Mr. Nettleship asked as to the length of time that the condition had probably existed in the first case.

Mr. Juler replied that the eye was a little myopic, but there was no history of special failure of vision.

Dr. Hill Griffiths referred to the case of a woman with a minute dotted appearance about the macula, whose sight was defective from abuse of tobacco; her sister had also the same condition of fundus; it was therefore probably a congenital condition.

Mr. Jessop asked, as to the second case, whether some of the pigment was not in the retina.

Mr. Juler replied that he had no doubt the retina was affected, inasmuch as the pigmentary layer was in places gone.

Mr. Adams Frost showed a case of systic tumour in the orbit, in a woman aged 35. It began two years previously as a prominence of the eye, and eighteen months later a soft swelling appeared at the upper and inner angle of the orbit, beneath the skin of the upper lid. Puncturing the cyst revealed nothing.

Cholesterin in Vitreous.—Mr. W. J. Collins showed a case of cholesterin in the vitreous in a man aged 66. It was probably a primary change. The right eye alone was affected. Von Graefe had seen such a condition disappear.

Exophthalmos.—Mr. W. J. Collins showed a case of exophthalmos with opacities of the lens; there was marked palpitation, but no goître, though a small one had been present a year previously. Neither von Graefe's nor Stellwag's signs were present.

Mr. Nettleship noticed there was partial ptosis of the upper lid on the side on which the disease began, the reverse of what was usually seen.

Mr. Collins thought this might be due to congestion; it was more marked than he had seen it before.

Franklin's Spectacles.—Mr. Brudenell Carter showed a pair of Franklin's spectacles, for use after cataract extraction, made by cementing two small semicircular plano-convex lenses upon

an oval of plane glass. They afforded both near and distant vision, and were not heavier than ordinary spectacles + 2 D. They were made by Baker, 244, High Holborn.

Artificial Eyes.—Mr. Ernest Clarke showed a group of artificial eyes, made by Maw, Son, and Thompson, at three shillings apiece

RECENT LITERATURE.

A. Retina. Optic Nerve. Centres.

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Rec. d'Ophth., 3, *p.* 174.

Birdsall and Weir. Case of sarcoma of the brain (occipital lobe), causing hemianopsia, removed by operation.
N. Y. Med. Record, May, 1887, *p.* 534.

Magnus. Zur Casuistik der Sympathicusreizung.
Kl. Mon.-Bl., May, 1887, *p.* 207.

Standard of vision for the army.
Brit. Med. Jour., April, 1887, *p.* 791.

Tea amblyopia.
The Lancet, May. 1887, *p.* 949.

Testaz. De la paralysie douloureuse de la septième paire.
Thèse., Paris. 1887.

Tillaux. Tumeur primitive du nerf optique.
Rec. d'Ophth., 2, *p.* 65.

Westphal. Ueber Ganglienzellengruppen im Niveau des Oculomotoriuskern.
Münch. Med. Woch., 12, *p.* 228.

B. Uveal Tract. Vitreous and Aqueous. Lens.

Armaignac. Choroidite aréolaire monoculaire terminée par le rétablissement à peu près complet de la vision mais avec persistance de l'aspect primitif du fond de l'œil.
Rev. Clin. d'Ocul., 3, *p.* 49.

Berlin. Beobachtungen über Staar und Staaroperationen bei Thieren.
Zeitschr. f. vergl., Aug., V., 1, *p.* 59.

Klein. Bemerkungen zur Lehre von der optischen Pupillenbildung.
Centr. f. d. Ges. Therapie.

Magnus. Ein Fall von Sichtbarsein des Canalis Cloqueti.
Kl. Mon.-Bl., May, 1887, *p.* 204.

Turnbull, C. S. Persistent pupillary membrane.
Boston Med. and Surg. Jour., March, 1887, *p.* 259.

C. Cornea. Conjunctiva. Sclera.

Armaignac. Epine ayant séjourné pendant trente-deux ans dans l'épaisseur de la sclérotique.
Rev. Clin. d'Ocul., 3, *p.* 53.

Bachet. Contribution à l'étude de la tuberculose primitive de la cornée.
Thèse., *Paris*, 1887.

Vianu. Traitement des maladies de la surface du bulbe oculaire par des vapeurs medicamenteuses.
Rec. d'Ophth., 3, *p.* 149.

D. Accommodation. Refraction. Motor Apparatus.

Borel. Affections hystériques des muscles oculaires.
Arch. d'Ophth., *VII.*, 1, *p.* 21.

Cuignet. Du strabisme convergent hypermétropique des enfants. Théorie nouvelle et traitement (concluded).
Rec. d'Ophth., 3, *p.* 155.

The influence of concave glasses on myopia.
Brit. Med. Jour., *May*, 1887, *p.* 1,119.

Williams, R. On a simple method of operation for divergent squint.
Brit. Med. Jour., *April*, 1887, *p.* 874.

E. Eyelids. Lachrymal Apparatus. Orbit.

Benson, A. H. The operative treatment of trichiasis, with or without entropion, and a short note on Argyll-Robertson's operation for ectropion.
Brit. Med. Jour., *May*, 1887, *p.* 1,154.

McKeown, D. Spasmodic entropion: new method of treatment.
Brit. Med. Jour., *May*, 1887, *p.* 1,159.

F. Miscellaneous.

Adler. Professor Ferdinand Ritter von Arlt.
Vienna, 1887.

Anderson. T. A new eye speculum.
The Lancet, *May*, 1887, *p.* 1,037.

Frost, W. A. Cocaine, and its employment in ophthalmic surgery.
Amer. Jour. Med. Sci., *April*, 1887, *p.* 455.

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Thèse., *Paris*, 1887.

A CASE OF FIBRO-SARCOMA OF THE ORBIT.

By H. R. Swanzy, F.R.C.S.I.,

Surgeon to the National Eye and Ear Infirmary, Dublin.

John McLaughlin, aged 11, was admitted to the National Eye and Ear Infirmary, Dublin, on the 8th December, 1887.

History.—His mother states that. about $4\frac{1}{2}$ years ago, she first observed his left eye to be getting larger, and from that time it has been gradually increasing in size. He has never had any pain in or about the eye or head. The sight of the eye became completely obscured about two years ago. He never had any other illness. He has two brothers and three sisters alive, and all of them are healthy with the exception of one brother younger than than himself, who has disease of the tibia. Two sisters died as infants.

Present state.—The left orbit is occupied by a tumour, of which the part which projects beyond the orbital margin measures 11 cm. in its equatorial and 11 cm. in its vertical diameter, while its circumference, taken at the orbital margin, is 24 cm. The tumour is spherical in shape, and smooth, not lobulated. On palpation it gives an elastic sensation. The growth fills the orbital opening accurately, and seems to be fixed to its lower margin. At other parts of the margin of the orbit some slight motion can be obtained between it and the tumour. The eyelids are increased in width and in depth so as to cover the whole of this large tumour, as well as the eyeball, with the exception of a portion of the tumour exposed in the palpebral fissure, which latter measures 8·0 cm. long, 3·5 cm. wide. It is, as just stated, a part of the surface of the tumour, covered apparently by conjunctiva, and not the eyeball, which is exposed in the palpebral fissure. The eyeball

has become completely dislocated upwards, and sits on the top of the tumour, as is well shown in drawings Nos. 1 and 2. The drawings are faithful reproductions of photographs.

The consensual motions of the globe, especially the lateral motions, are retained to some extent, notwithstanding the abnormal position of the eyeball, and can be observed through the attenuated eyelid. The shape of the eyeball is preserved, although its tension is reduced to T − 2. There is no power of perception of light. The dimensions of the orbit are enormously increased, and its margin somewhat everted.

Fig. 1.

The left side of the hard palate is a little lower than the right side. The patient has not, and never had, any discharge from the nose, nor epistaxis; and the left nostril is quite free, although pressed on by the tumour. The sensation of the skin of the face, and of the eyelids, is normal.

There are no enlarged glands in the neck, nor signs of secondary growths in other parts of the body. The boy is pale and of slight build, but seems to be in good general health, and, except that he is careful not to get a blow on the tumour, he enjoys play with others of his own age.

I kept the patient under observation in hospital for three weeks, during which time the tumour increased sensibly in size.

There being some question as to whether or not some obscure fluctuation existed in the tumour, an exploratory puncture with a hypodermic syringe was made, but no fluid was obtained.

Operation and After-Treatment.—I proceeded to remove the tumour on the 31st December last, and had the advantage of Mr. William Thomson's valuable aid and counsel at the operation. We were prepared for the securing of large vessels, for the cutting away of bone, and thought it quite possible we might see something of the cranial cavity before the operation was concluded.

Fig. 2.

I first enlarged the palpebral aperture by dividing each commisure extensively with scissors, so as to admit of the eyelids being completely reflected upwards and downwards. This exposed the eyeball, which presented a perfectly normal aspect with moveable pupil, but with cataractous lens. I then found that owing to a ligamentous band, which stretched from one to the other, I could not pass my finger at any place between the orbital margin and the tumour. With strong

scissors I divided this ligamentous ring all round, and then, pressing my finger between the tumour and the orbital margin, I found I could get it well behind the tumour in all directions; and, with the finger alone, I was enabled rapidly to raise the growth out of the orbit, to the walls of which it was not anywhere adherent. The tumour accurately filled the orbit, so that my finger was tightly pressed between the two as I passed it around and behind the growth. At the apex of the orbit there was some connective tissue and fat, which was detached from the tumour with the scissors. The optic nerve was not seen during the operation. It had probably become atrophied to the size of a fine thread.

Fig. 3.

After the removal, the sides of the enormous orbital cavity —measuring 7 cm. vertically, 6·5 cm. horizontally, and 4·5 cm. in depth—were found to be perfectly smooth and shiny, as though lined with a tense and tendinous membrane, probably a modified periosteum. The surface of the part of the tumour which had filled the orbit was also perfectly smooth and shiny, as though covered with a serous membrane.

There was very little bleeding. That from a few vessels in the walls of the orbit was easily arrested with the thermo-cautery. The cavity was irrigated with a solution of perchloride of mercury (1 in 4,000), freely powdered with iodoform, and plugged tightly with sponges, the eyelids laid over the latter, and a tight bandage applied. Next day, the sponges were removed and, it having been ascertained that all tendency to hæmorrhage had ceased, I pared off the ciliary margins of the eyelids, and united the cut edges with a few points of interrupted sutures, leaving an opening for drainage at either end. For some days a bit of drainage tube was kept in each of these openings. Good union took place between the eyelids. The cavity was washed out daily through the openings with a solution of perchloride of mercury, and iodoform was blown in.

A week after the operation slight purulent discharge made its appearance and continued for a month or more, when it gradually ceased, the posterior surface of the eyelids having become adherent to the walls of the orbit. On the day after the operation, the temperature was 101·2°, but it did not again reach 100°, although it kept slightly above normal for three weeks. The third drawing illustrates the condition after healing was complete.

Microscopic examination showed that the growth was a fibro-sarcoma, with marked predominance of the fibrous over the sarcomatous structure. It could not be decided with certainty in what tissue the growth originated, but it seems probable that it commenced in the retro-bulbar connective tissue.

CASES OF TUMOUR OF CORNEA AND CONJUNCTIVA.

By Arthur H. Benson, M.A., F.R.C.S.I.,

Ophthalmic and Aural Surgeon to City of Dublin Hospital, Assistant Surgeon to St. Mark's Ophthalmic Hospital.

1.—*Fibroma of Cornea (second communication*).*—On November 5th, 1886, I exhibited to the Pathological Section of the Academy of Medicine in Ireland, sections of a corneal

* Read before Patholog. Section Acad. Med. Irel., Apl. 15, 1887.

fibroma, and read the notes of the case in full (*Vide* O. R., Vol. VI., p. 5). I am now able to supplement my previous remarks and to show sections of the tumour which recurred in the same position.

The first tumour was removed, as stated, in October, 1886, and for about two months there was no appreciable recurrence, insomuch that the gentleman in whose service the patient now is as children's maid, engaged her without knowing that she had suffered from any affection of the eye. A slight nebula was, however, always present, though it was by no means obviously visible. On January 24th, 1887, that is, about three months after its first removal, she returned to Saint Mark's Hospital. The tumour had again formed in the old position, but was much smaller and less elevated than the previous one, and it had square edges instead of circular.

With Dr. Story's advice and assistance I again removed it, dissecting it off with the help of Bowman's trephine as before. I then applied some solid nitrate of silver to the exposed corneal surface.

There has since then been no recurrence of the tumour, but unfortunately the girl did not remain after the operation to have the eye dressed, but went away and stayed away for a week, and when she returned it was with a perforating ulcer and synechia anterior for which she is still under treatment.

Histologically the new tumour seems very similar to the former, both being like ordinary corneal tissuse, only opaque.

The interest of the case lies in its rarity, most histologists denying that such growths ever occur.

2.—*Melanotic Tumour of Conjunctiva.*—James Bowden, aged 11 (Disp. S.M.O.H., 4,734, March 19th, 1887), first came to see me at St. Mark's Ophthalmic Hospital in 1883. He then had a small, sharply-defined, moveable, dark-brown or nearly black mark on his conjunctiva, close to the corneal border of the left eye. This caused no irritation, and looked innocent in character, so I advised to leave it alone, telling the boy's father to watch it, and let me see him if it grew any larger.

In March, 1887, *i.e.*, after an interval of five years, I again saw the boy. The growth was similar in appearance, but was

both larger in superficial area, and raised above the surface of the conjunctiva. The boy's father thought it was growing decidedly of late.

It was then about 8 mm. in length and 3 mm. in breadth, and followed the margin of the limbus conjunctivæ. Ophthalmoscopic examination under atropine failed to discover any implication of the contents of the globe. The eye was hypermetropic, with vision only $\frac{6}{24}$; the right eye being emmetropic, with vision $\frac{6}{6}$.

The tumour was easily removed by forceps and scalpel; it was free everywhere except at the limbus conjunctivæ, where slight dissection was necessary. The wound healed in a few days, and no appearance of recurrence has, so far, shown since March 19th, 1887.

Histologically the tumour consists of fibrous tissue with masses of sarcomatous-looking cells, and a considerable quantity of pigmentation. Much of the pigment is accumulated immediately under the epithelium of the conjunctiva.

ON THE SHALLOW ANTERIOR CHAMBER OF PRIMARY GLAUCOMA.

By Priestley Smith,

Ophthalmic Surgeon to the Queen's Hospital, Birmingham, &c.

A shallow anterior chamber, though not always present in primary glaucoma, is a well marked characteristic of that disease, and especially of its more acute congestive forms; *an advance of the lens and iris towards the cornea usually accompanies the onset of the high tension.* Any hypothesis therefore which professes to explain the increase of tension, whether by hypersecretion or by undue retention, must explain the fact that the vitreous chamber appears to enlarge at the expense of the aqueous chamber.

This consideration led me, in my first investigation of the subject, to assume the presence of some obstruction in the region of the circumlental space—an obstruction which would impede the passage of fluid

from the vitreous to the aqueous chamber. Researches directed to this point brought to light the continuous enlargement of the lens,* and showed a corresponding increase in the liability to glaucoma throughout life,† and these facts, together with some others to which I need not here refer, left no room for doubt in my own mind that a diminished or insufficient space between the lens and the structures which surround it is an important predisposing cause of primary glaucoma. Still, after the careful examination of many specimens, I am unable to assert that the disease is actually induced by an obstruction in the circumlental space, *i.e.*, by an obstruction impeding the normal flow of fluid from the vitreous to the aqueous chamber; and yet, in the absence of such an obstruction, *why does the lens move forward when the intra-ocular pressure rises?*

As a result of further consideration, I now desire to modify the explanation which I have previously put forward; the true answer to the question is, I believe, a very simple one after all. *An advance of the lens is the natural consequence of an increase in the quantity of blood in the interior of the eye.*

When the quantity of blood contained in the internal vessels of the eye, of which the most capacious are those of the uveal tract, is augmented, either by a quicker afflux or a slower efflux, compensation must be made either by the expulsion of some other fluid from the eye, or by over-distension of the sclera. We know that the main outlet of the eye, apart from the blood-vessels, is the angle of the anterior chamber. Here the aqueous fluid filters out very readily into Schlemm's canal and the veins connected with it, under the normal pressure of about 25 mm. of mercury, and under a higher pressure the outflow is quickened. We know also that the amount of fluid which filters out of

* Trans. Ophth. Soc., Vol. III., p. 79.

† Trans. Ophth. Soc., Vol. VI., p. 294.

the vitreous chamber is very much smaller than that which filters out of the aqueous chamber in the same space of time.* There can, I think, be no doubt that when, from any cause, the amount of blood in a healthy eye is increased, the escape of the aqueous is quickened so that a compensatory reduction is effected in the fulness of the aqueous chamber, the partial emptying of the chamber being accompanied by an advance of the lens. We may compare the action of the aqueous fluid in this respect with that of the cerebro-spinal fluid: each acts as a pressure-regulator within its own cavity. The advance of the lens appears to be inevitable when we consider that the turgescence of the uveal tract tells mainly upon the contents of the vitreous chamber.

Under ordinary circumstances such variations in the depth of the anterior chamber are doubtless very small. If they were considerable they would probably reveal themselves by changes of refraction. I may note in passing that congestion of the head *does* produce some alteration of vision: in the emmetrope a slight dimness of distant vision, which, in my own case, is due to a slight change in the direction of myopia, such as would occur during a very slight advance of the lens. Be this as it may, the compensatory changes above described are usually slight, transient, and devoid of danger. But *under certain predisposing conditions an advance of the lens may involve an attack of glaucoma.*

Certain experiments of my own have shown, both for the eye of the pig and for the human eye, that when the lens is driven forwards by a slight excess of pressure in the vitreous chamber the ciliary processes are pressed forward against the base of the iris, and the angle of the anterior chamber closed so firmly as to arrest the

* I cannot here detail the evidence on which these statements rest; it may be found in my first work on glaucoma (London: Churchill, 1879). Suffice it to say that I adduce no facts which are not, in my opinion, well established, and that I intend before long to publish a complete consideration of the whole subject.

escape of the aqueous fluid.* This fact is most significant in relation to the glaucoma process, but it appears to have attracted little notice. Evidence of it may be obtained by any one who will take a healthy eye from the pig or human subject and firmly squeeze it between the finger and thumb. He will find it impossible to empty the anterior chamber even by great pressure long continued; and yet under normal conditions the aqueous flows out freely. *The advance of the lens locks the outlet.*

I believe that this locking of the outlet after a certain quantity of the aqueous has been driven out is a preservative mechanism, for in the absence of such a check, external pressure would squeeze out the whole of the aqueous and endanger the internal structures, whereas under the actual conditions it is impossible to greatly deform or distort the globe by any ordinary external pressure. Unfortunately it is not always an equal safeguard against mischief by internal pressure, but sometimes the reverse.

Let us now consider more closely the conditions which appear to initiate attacks of glaucoma. They are most obvious in the acute forms of the disease. Nervous exhaustion through violent emotion, through shock, through illness, through want of food or sleep, through exposure to damp and cold; cardiac weakness, chronic cough, climacteric congestion, obstinate constipation; vomiting, stooping, straining; in short those conditions which tend to overfill the veins of the head are common precursors of glaucomatous attacks. Arterial hyperæmia is certainly sometimes present, *e.g.*, in cases connected with neuralgia of the fifth nerve, and with external irritation of the eye; but venous hyperæmia—the passive congestion which depends rather on obstruction than on acceleration of the blood streams—is, I think, to be found far more frequently.

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* Glaucoma, &c. London: Churchill, 1879, p. 133.

Under these conditions the escape of venous blood from the eyeball is embarrassed; the large vortex veins and all their tributaries, especially the highly convoluted vessels of the ciliary processes, become distended; and the hyperæmia may reveal itself subjectively by photopsia —"balls of fire," "flashes of light," and so forth. Meanwhile, as the blood in the eye increases in quantity the aqueous fluid diminishes, and this compensation prevents any considerable rise of pressure; the aqueous chamber becomes slightly shallower than before, but its angle remains patent. This is a physiological process; it is not glaucoma. It leads on to glaucoma only in a small minority of cases, in which the outlet of the eye is predisposed to compression and occlusion. *The usual predisposing cause is an insufficient circumlental space.*

A paroxysm of whooping cough may produce an engorgement of the head and eyes so intense as to induce convulsions and to rupture the superficial vessels, and in this engorgement the internal vessels of the eyes must certainly share to some extent. Yet children thus affected do not get glaucoma. In the youthful eye the lens is comparatively small, the anterior chamber deep, the space at the disposal of the processes sufficient for their free expansion without undue displacement of the iris. As life advances the conditions alter: the lens enlarges and encroaches on the space in which it lies; the anterior chamber grows shallower; the ciliary processes are brought into closer relations with the adjacent structures. These changes are physiological, and are compatible under ordinary conditions with the integrity of the eye, but they underlie the increased liability to glaucoma which is acquired with advancing years.* A congestion of the eye which would be harmless in early life may in advanced life easily induce acute glaucoma.

The course of events may be pictured thus:—The vessels of the uveal tract are overfilled; the ciliary

* Trans. Ophth. Soc., Vol. VI., p. 308.

processes swell up ; a part of the aqueous is expelled and the lens advances ; the angle of the chamber is compressed. From this moment the intraocular pressure rises rapidly, and the obstruction at the outlet intensifies itself. The increased pressure within the eye embarasses the escape of venous blood still further and aggravates the swelling of the processes ; the engorgement increases, the lens is driven forward still more forcibly until not an atom more of the aqueous can be forced through the closed outlet ; a shallow but firmly locked anterior chamber remains. The internal circulation of the eye is strangulated because the normal process of compensation by the aqueous is arrested. The external vessels dilate, and serum escapes in the directions of least resistance. This is acute glaucoma.

The foregoing description of acute glaucoma involves a conception which, so far at least as I am concerned, is new. *The high tension depends more upon an excess of blood in the eye, than upon an excess of the intraocular fluid.* We see evidence of this fact in the free escape of blood which commonly accompanies an iridectomy for acute glaucoma.

A shallow anterior chamber is less characteristic of the chronic non-congestive type of glaucoma than of the acute congestive. This of itself indicates the close connection of the symptom with vascular disturbance. I imagine that *glaucoma fulminans* is the expression of a maximum obstruction of the circulation, *glaucoma simplex* of a minimum, the conditions of the eye which predispose to the disease being similar in the two cases. In the former there is strangulation sudden and complete ; compensatory adaptation of the blood vessels is impossible ; an acute œdema limited by pressure ensues, and reveals itself by the extreme impairment of vision met with in such cases, by the cloudiness of the media, and by the chemosis of the conjunctiva. In the latter variety, on the other hand, the vascular disturbance

is gradual and slight ; the vessels adapt themselves to the slowly increasing pressure ; the angle of the anterior chamber is more or less compressed but not closed. Careful examination of appropriate specimens of the disease shows that such differences actually exist.

Between these two extremes all possible grades are to be met with, and it is especially interesting to note how the less severe are converted into the more severe by agents which influence the condition of the angle of the chamber and the vessels of the head. Thus, atropine, which helps to block the angle of the chamber by thickening the periphery of the iris, does mischief when glaucoma is imminent or already present ; eserine, which helps to open it, may retard or cut short the progress of the disease. Cold, sleeplessness, hunger, constipation, and other causes of venous hyperæmia aggravate an incipient glaucoma ; warmth, sleep, food, &c., not unfrequently relieve it.

It is beyond the scope of the present paper to discuss the tissue changes which are found in eyes blinded by glaucoma : the permanent adhesion of the iris-periphery to the cornea ; the dilatation of the arteries ; the atrophy of the ciliary muscle ; the enlargement, or later the shrinking and retraction, of the ciliary processes ; the œdema of the cornea ; the excavation of the optic disc. These are consequences of the vascular obstruction and the exalted pressure which constitute the essential factors of the disease. They have been most minutely and successfully studied, but glaucoma is a disease which cannot be explained by a scrutiny, howsoever minute, of the tissue changes which accompany its progress. In this case, as in some others, a too exclusive study of histological changes has, I think, diverted attention from the physical principles involved in the problem. It is to my mind most remarkable that dissertations on glaucoma are still published in which little or no value is attached to Leber's all-important discovery—the escape of the

aqueous at the angle of the anterior chamber ; or to the common characteristic of all forms of glaucoma, both primary and secondary—the obstruction of this outlet.

Czermak and Birnbacher have recently published an account of some most interesting physical experiments concerning the osmosis of circulating fluids through the walls of tubes, under conditions similar to those of the internal blood-vessels of the eye (*vide* O. R., June, 1887, p. 173). Mr. Story has recently given a demonstration of the phenomena to the members of the Ophthalmological Society. To these experiments I would draw especial attention ; they illustrate in the clearest manner how an obstruction at the outlet of the eye leads by the action of physical laws to the embarrassment of the intraocular circulation. From some of the inferences drawn by these observers from microscopic researches I venture, however, to dissent entirely. Their study of glaucomatous eyes appears to have included no recent cases, and I hold, as above indicated, that tissue changes which are found in eyes which have been long tense, exhibit the results rather than the initial causes of high pressure and obstructed circulation.

Rheindorf (Neuss). On Glaucoma. *Klin. Monatsbl. F. Augenheilk., June,* 1887, *p.* 148.

The author advances a hypothesis concerning the nature of glaucoma which is, to a certain extent, new. It is, moreover, explicit and coherent, and therefore open to discussion. We shall in the first place give, without comment, an abstract of his argument and conclusions, and then append a brief criticism.

Primary glaucoma is the expression of a hindered outflow of fluid from the posterior into the anterior portion of the eye, caused by a thickening of the lens-and-zonula diaphragm.

Secondary glaucoma is the expression of an increased secretion of fluid due to local irritation of a portion of the uveal tract, especially the ciliary body and processes.

There is no resemblance in the essential natures of primary and secondary glaucoma, although one symptom—increase of intraocular pressure—and its consequences, are common to both.

Apart from the increased tension, there is no symptom so characteristic of acute glaucoma as the advance of the lens and the consequent alterations in the positions of the iris and pupil. This advance of the lens can only be explained by supposing some change in the zonula-and-lens diaphragm, which hinders the passage of fluid from the vitreous chamber to the aqueous chamber.

Assuming, for the sake of argument, that there is in glaucoma a secretory neurosis causing increased flow of fluid into the vitreous chamber—an assumption for which, in spite of many experiments, we have no evidence—why should not this hypersecretion be compensated by a corresponding quickening of the outflow, if the condition of the zonula is normal? When fluid is taken into the body in excessive quantity we do not get ascites but an increased excretion by the kidneys and skin. In like manner in hypersecretion within the eye we should expect simply an increased outflow, or at most some over fulness of the whole globe, not a distension of the vitreous chamber at the expense of the aqueous.

Blockage of the angle of the anterior chamber does not explain this symptom; such blockage must cause a deepening rather than a shallowing of the anterior chamber.

Narrowing of the circumlental space through enlargement of the lens, the zonula being normal, would be readily compensated by a quickening of the stream which passes through it.

In spite of some recent statements to the contrary, there is strong evidence that fluid passes forward from the vitreous through the circumlental space, and in some degree through the lens itself. With advancing age the sclerosis of the lens probably diminishes the passage of fluid through its substance; the circumlental space then becomes the only channel. If the zonula also, through senile changes, offers an increased resistance to the passage of fluid, retention in the vitreous chamber must occur. Increase of pressure in the vitreous chamber involves advance of the lens, tension of the zonula, and dragging on the ciliary processes.

If the supposed thickening of the zonula proceeds very gradually without intercurrent congestion of the choroid, the vitreous pressure rises very slowly; the ciliary processes are able to accommodate themselves to the increased tension of the zonula. They are irritated, but not inflamed; an increased blood flow to the processes causes a further thickening and strengthening of the zonula; it can support the increased vitreous pressure without further advance of the lens. This is glaucoma simplex.

If the thickening of the zonula occurs quickly, or if from any cause there is sudden hypersecretion into the vitreous chamber, then there is a sudden drag upon the ciliary processes to which they have no time to accommodate themselves, and cyclitis is the result. This is acute glaucoma.

Glaucomatous inflammation is a cyclitis; its cause is the advance of the lens and the associated dragging on the ciliary processes.

The thickening and impermeability of the zonula are at present hypothetical.

Evidence in favour of this glaucoma theory is found in the occasional connection of glaucoma with cataract. Lental opacity sometimes rapidly develops during the onset of glaucoma, or just before it. This occurrence, in certain cases recorded, could not be a mere coincidence. It is conceivable that the commencing obstruction at the zonula impairs the nutrition of the lens, and that the rapidly developed lental opacity causes an additional obstruction to the passage of fluid through the zonula and lens diaphragm. It is difficult, however, to say why lental opacity is not a more frequent cause or concomitant of glaucoma.

Further evidence is found in the good results which follow the removal of the lens combined with rupture of the hyaloid membrane in glaucomatous eyes. This proceeding gives unexpectedly good results in cases of absolute glaucoma, which would otherwise need excision for the relief of pain; it does not lead to intraocular hæmorrhage. It gives equally surprising results in cases of glaucoma, in which iridectomy or sclerotomy have failed. It is, of course, not to be recommended in hæmorrhagic glaucoma.

The occasional occurrence of glaucoma after cataract extraction may be explained by supposing that the posterior capsule and hyaloid membrane are sometimes so impermeable as to cause an obstruction to the passage of fluid, even in the absence of the lens itself.

The curative power of iridectomy and sclerotomy may be explained by supposing, as several observers have done, that these operations cause a rupture of the over-tense zonula, and thereby promote the free escape of fluid previously imprisoned in the vitreous chamber by the impermeable diaphragm. A very small rupture would suffice for this purpose, and it is unquestionable that such rupture may occur without loss of vitreous during the operation.

Secondary glaucoma is due to a variety of causes, which are alike in this, that they all produce irritation of the iris and of the ciliary body. Hence it must be assumed that the increased tension is due to hypersecretion of aqueous and perhaps of vitreous fluid. A compensatory increase in the outflow does not occur, and consequently the tunics of the eyeball are distended, and when this distension has reached its maximum, increase of the intraocular pressure and its consequences ensue.

In drawing attention to the advance of the lens in acute glaucoma, as a point of great significance, Dr. Rheindorf is, we think, entirely in the right. We have for years urged precisely the argument which he here employs. It is surprising, however, that he should overlook the fact that an advance of the lens under the influence of pressure from behind, is capable of compressing and closing the angle of the anterior chamber; and it is still more surprising that the closure of this outlet, the most salient and indisputable point in the pathological anatomy of glaucoma, should find no place in his description of the glaucoma process. This omission involves, moreover, a misconception concerning the whole group of conditions which we class together as secondary glaucoma.

Increase of the intraocular pressure and its consequences are common to the primary and secondary forms of the disease, says Dr. Rheindorf. He does not say, what is equally true,

that an obstruction at the main outlet of the eye is also common to both, and is an essential factor in every variety of the disease. He falls back, instead, upon the hypothesis of an irritative hypersecretion, an idea which is contradicted by the actual conditions which we find in the glaucomatous eye. In eyes which have been tense for a long period of time we find the ciliary processes in an advanced stage of atrophy, and the outlet of the eye impervious. Hypersecretion is here a physical impossibility; the process of secretion is almost completely suppressed by resistance from in front: a condition of stagnation which finds expression in the degeneration of lens and vitreous. High tension bears no relation to the degree of irritation which may be present in the eye; indeed, cyclitis, which Dr. Rheindorf appears to consider as almost synonymous with glaucoma, invariably leads, when severe, to loss of tension through malnutrition of the vitreous. The one thing to which high tension *does* bear a constant relation is a retarded escape of aqueous at the angle of the anterior chamber.

With regard to the supposed obstruction to filtration through the zonula (or rather, we would say, through the hyaloid membrane, for the free portion of the zonula is nothing more than a series of minute cords with open interspaces), we believe that some cases of glaucoma are actually caused in this way. The anterior part of the vitreous is sometimes occupied by blood-clots or serous effusions which might act in the way supposed, but in the great majority of specimens no such obstructive changes are to be found. Rheindorf's explanation may be true, we think, for a few cases of hæmorrhagic and other exceptional varieties of glaucoma—in short, for the atypical cases in which iridectomy fails, rather than for the typical in which it cures.

The successes attained by the author by extraction of the lens are most worthy of attention.

With regard to the causation of the shallow anterior chamber of primary glaucoma and the nature of the glaucoma process we have written more fully in an article which appears in the present number.—P. S.

P. H. Mules (Manchester), C. B. Taylor (Nottingham), R. W. Doyne (Oxford), E. D. Bower (Gloucester). Modes of Treating an Iris-complication in Cataract Extraction. *Brit. Med. Journ., June 11th*, 1887, *and July 2nd*, 1887.

An interesting discussion has arisen in connection with a question raised by Dr. Mules: What shall we do if during corneal section the iris falls over the knife?

Mules relates a case in which he overcame this difficulty in an unusual manner, and with good result. The eye was under the influence of cocaine, and all went well until the moment of counter-puncture, when, without the slighest warning, the patient lurched his head half round, throwing the upper segment of the iris over the knife and wounding it at the same time. Only two courses were apparently open. One, to proceed with the operation, cutting out the wounded and entangled iris with the knife; the other, to withdraw the knife, treat the case as one of "trauma of the iris," and operate at a later period. The first, a usual and sufficiently practical method if a small flap is involved, would in this case have sacrificed a third of the whole iris, making an enormous coloboma and materially affecting vision, beside leaving the operator's hands as "a piece of work of which he might well be ashamed." The second would appear the wiser course, but it is unpleasant to confess that an accident has occurred which requires the operation to be postponed. He took a third course—withdrew the knife, leaving, as may be supposed, a very shallow anterior chamber and no aqueous, made a fresh puncture and counter-puncture higher up, completed the corneal section (a small one), and removed the wounded iris, treating the patient as by preliminary iridectomy. The lens was extracted later, and the case did well.

Taylor states that he has for years been in the habit of performing iridectomy with the knife wherever it has appeared that the patient's chances of recovery from cataract extraction would be increased by abscission of a portion of the iris. With a little practice this may, he says, be done with great precision, and a coloboma obtained in no way inferior to that secured by any other method, while the pain is incomparably less, either

with or without cocaine, and the risk to the patient from involuntary spasm or untoward motion reduced to zero. When an iridectomy as part of cataract extraction is necessary, he maintains that this slicing off with the knife while making the preliminary incision is the best way to do it, but he considers it very seldom necessary. He says: "I have, within the last three years, extracted for cataract in upwards of 500 cases without iridectomy, and, in the great majority of these, have secured a central and movable pupil, infinitely superior to anything obtainable by the more complicated operation."

Doyne urges that the proceeding adopted by Mules is not commonly to be recommended in such emergencies, for even if the patient be absolutely quiet, the difficulties of the operation must be great when the cornea and lens capsule are in apposition, and the former so relaxed that it will not resist, but be pushed before the knife, making it very difficult to appreciate when the point has penetrated its whole thickness. He advocates a very simple plan shown to him by Mr. Hussey. It consists in drawing the eyeball forward on the flat of the knife after the counter-puncture has been made; the iris will roll off the edge of the knife, and the section can then be completed.

Bower urges that the surgeon should prevent the iris from falling over the knife by always performing the iridectomy as a preliminary and separate operation. In his own practice he has adopted this proceeding and obtained better results and a higher percentage of success than when excising the portion of iris at the same time as the extraction of the lens.

This advice does not exactly meet the point at issue, but we entirely agree with the writer in attaching considerable value to a preliminary iridectomy. He puts the advantages as follows:—

When the patient finds that during the preliminary iridectomy he has experienced no pain and exceedingly little discomfort of any kind after it, he approaches the second operation of extraction with good nerve. The behaviour of the eye during and after the iridectomy gives some idea as to the way in which it will probably bear the second operation, and shows very certainly whether during the cocaine anæsthesia there is any tendency to involuntary muscular spasm. The operation of extraction is made shorter, and also unquestionably easier. The iris

cannot fall in front of the knife whilst making the corneal section. The size of the piece of iris to be excised can be better regulated through the small incision made with a kerotome, than in the larger wound necessary for the extraction of the lens. There is no bleeding from the iris, and consequently less risk of soft matter being left behind, as may sometimes be the case where the blood cannot easily be removed. There is less fear of iritis. The risk of hæmorrhage between the retina and choroid and into the vitreous is probably less, owing to the intra-ocular tension being diminished more gradually. There is less fear of septic infection.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 9TH, 1887.

J. W. HULKE, F.R.S., President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

Optic Atrophy in one Eye and Temporary Hemianopsia in the other.—Mr. Story.—The patient, a young woman engaged in dressmaking, came complaining of loss of sight in the right eye, and impaired vision of the left. The affection had come on gradually. The catamenia were irregular, and she complained of headache and sleepiness. She had also noticed that she was becoming stouter. On examination there was found atrophy of the right optic disc and temporal hemianopsia in the other eye. Her general condition remained fairly satisfactory.

Mr. Nettleship remarked that a very similar case had been recorded in the "Transactions," in which, after death, a tumour was found in the pituitary fossa. Other similar cases had been published, and he had lately seen a case at St. Thomas's Hospital, where the same train of symptoms had been produced in the same way.

Dr. Hill Griffith said that he had placed on record a case identical with that of Mr. Story. Cessation of menstruation

and sleepiness had been present in his case; and, in several cases that he had seen, the patients had complained of getting stout.

Dr. James Anderson briefly described the case he had published, which closely agreed with that of Mr. Story. He said that it was the rule in pituitary tumours that the patient should get very stout.

Dr. Coupland mentioned also the concurrence of an increased development of fat in conjunction with disease or enlargement of the pituitary body.

The Permeability of the Suspensory Ligament by Organised Substances.—Dr. Hill Griffith related several cases of keratitis punctata without iritis, but with recent patches of choroido-retinitis, and also two cases of retinal gliomata, with separate nodules free in the anterior chamber, and showed naked eye and microscopical specimens. He endeavoured to show from these two groups of cases that solid particles were carried by the nutrient currents through the zonule at the circumlental space.

Mr. Jessop mentioned a case of an old opaque lens in which, on opening the eye, a gush of cholesterine spangles came from above and behind the iris, and fell to the lower part of the anterior chamber, forming a triangle with the apex upwards. The cholesterine was so large in quantity that it must have come from the vitreous.

In reply to Mr. Marcus Gunn, Dr. Hill Griffith said that in his case there was evidence of choroiditis gradually passing into atrophy of the usual description.

Mr. Lang showed a specimen with the suspensory ligament *in situ*. He said that the association of solitary patches of choroiditis with keratitis punctata was constant; the cases were more frequent in young women, but occurred also in young men. The etiology was obscure and the vision not much affected when the cases were first seen.

Mr. Nettleship agreed with Mr. Lang as to the presence of isolated patches of choroiditis in a large number of cases of keratitis punctata. Opacities of the vitreous were often present, and were sometimes found even when there was no choroiditis, and in some only the keratitis punctata could be

seen. The dots on the back of the cornea could only be explained on the hypothesis that there had been migration through the suspensory ligament.*

Mr. J. B. Story could not accept this view, as it would not explain those cases where there was no keratitis punctata. He thought it was very difficult to exclude the theory that there was some cyclitic deposit.

The President thought another explanation was possible apart from the mechanical transfer theory. There might be an inflammatory process, and cyclitis, or choroiditis, or both, expressive of some general conditions. Some of the spots were only flocculent precipitates or coagula lying loosely; some might be due to proliferation and disintegration of the epithelium. The anatomical difficulties in regard to the mechanical convection theory appeared to him to be very great.

Mr. Silcock mentioned the case of a lady in which a punctate appearance at the back of the cornea was associated with opacities in the vitreous but without choroiditis.

Mr. Mackinlay observed that he was unable to detect the spaces in the suspensory ligament, even with powerful lenses.

Mr. Hutchinson, Jun., argued that a transmission of particles might take place in a direction the reverse of the ordinary, as there was reason to believe happened in cases of axillary tumour.

Mr. W. J. Collins suggested that particles might pass along the canal of Stilling, and thus the necessity for supposing that they traversed the impervious hyaloid membrane would be obviated.

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* The secreting surface of the ciliary processes is in intimate relation both with the aqueous chamber and with the vitreous body, and perverted secretions pass, like the normal secretion, simultaneously into both. Is not the simultaneous appearance of keratitis punctata and cloudiness of the vitreous, the natural outcome of certain forms of cyclitis? It can hardly be doubted that what we call "serous iritis" is really a cyclitis characterised by a morbid albuminous secretion, and that "keratitis punctata" is essentially of the same nature. The three portions of the uveal tract frequently participate in the same morbid processes, and it seems by no means strange that patches of choroiditis are sometimes found in company with sub-acute cyclitis.—P.S.

Dr. Hill Griffith said he had, like Mr. Nettleship, seen cases of descemetitis without iritis, in which he had failed to make out choroiditis; the cases he had recorded were put forward as examples of the most usual conditions met with in descemetitis. To Mr. Story's objection that choroiditis did not always produce descemetitis, he would reply that cyclitis was not always followed by that condition. He could not accept Mr. Hulke's explanation of a coincident cyclitis to account for his cases, for here, as in diseases of the nervous system, we should avoid a "double lesion" if one be sufficient to account for all existing symptoms.

Successively-occurring Isolated Spots of Choroido-retinitis affecting the Yellow Spot Region.—Mr. Brailey.—The patient, aged 41, had been under observation for seven months and a half, during which period he had five times experienced the development of a small relative scotoma at or near the centre of the field of vision of his right eye, which was wearing its full correction (+3.50 sph. and + 1.D. cylinder). His left eye had been absolutely blind from glaucoma for twenty years, and was still hard, though painless. The scotomata, as appreciable by him at eighteen inches, varied in size from two to six inches square. Each appeared as a round or oval disc of dim and troubled vision, surrounded by a bright glittering edge. There was annoying dimness and distortion of objects, which appeared materially darkened when embraced in this area. Printed letters appeared diminished as well as huddled together. Distant vision, though diminished even to one-half in a moderate light, was not much affected with bright light, whether day or artificial. All colours, except perhaps green, were dulled, as if dashed with grey. Soon the spot began to amend and was more translucent, giving to his sight the impression of an interposed disc of neutral tinted glass, whose sharp edge slightly glittered in places. Each spot had resulted in almost perfect restoration of vision, as estimated by test-types, though the ophthalmoscopic appearances still persisted to some degree. Ophthalmoscopically, each scotoma corresponded to a small, rounded, isolated, not well-defined spot of dull greyish colour. Most of them were in close relation to, though clearly on a lower level than, the retinal blood-vessels, which were here decidedly larger than usual. The optic disc

was slightly hazy at its margins, though of normal colour. An ophthalmoscopic drawing was exhibited, which showed three of the spots, one moderately recent, and two in process of fading.

Mr. Waren Tay thought the case in some respects very unusual, and considered that the retina must have been affected.

The President said that the patient, being an artist, would observe and describe his visual defects with greater accuracy than ordinary patients.

Kerato-iritis.—Mr. Silcock.—The patient was a woman probably the subject of congenital syphilis. The peculiarity of the case consisted in the presence of a number of minute dots situated either on the surface of Descemet's membrane, or in the deepest layers of the cornea, and arranged in the form of a circlet which corresponded in position with the pupillary margin of the iris; the affected cornea also presented the usual characteristics of interstitial keratitis. The cornea of the other eye was unaffected.

Tumour of Cornea.—Mr. Cross.—The President mentioned a case in which he shaved off the growth and applied nitrate of silver freely, with the result of a scar, which had so far not been followed by recurrence.

Opaque Nerve-Fibres limited to the Papilla.—Mr. Cross.

Hæmorrhage into a Blind Eye, with Coarctation of Retina.—Mr. W. J. Collins.

Corediałysis, with complete Anteversion of detached portion of Iris.—Mr. Lawford.

Sequel to case of Cyclotomy in Glaucoma.—Mr. G. E. Walker.

Pulsating Exophthalmos in process of cure.—Mr. Walker.—The patient had been shown at the November meeting, when the symptoms were much more marked. The disease had been caused by a fall down some cellar-steps on to a flagged floor in February, 1886; this produced insensibility for three days; and, on awakening, the boy found he had a swishing noise in his head. No ocular symptoms became manifest until July, when engorgement of the right eye appeared, and, a fortnight later, of the left. In a day or two the latter disappeared, and then proptosis of the right took place. This increasing, he

had proposed to tie the carotid in the neck, as he believed a true aneurysm of the artery, where it turned up from the cavernous sinus, had been produced. But on account of the opinion of two gentlemen who believed it was not true aneurysm, but an opening of the carotid into the cavernous sinus, the operation was not performed. From October to the end of January the general symptoms appeared to be stationary, but at that time—January 20th—he was much frightened by being caught in a crush in a theatre, and soon afterwards found the *bruit* had ceased. The extrusion of the eye, its engorgement and pulsation, at first were considerably increased, but afterwards decreased, at first rather quickly, and since then very slowly. He contended that although in this case a happy result had been brought about by an accident, it would be wise in a future case to tie the carotid, and not to trust to the chapter of accidents; and he gave a short account of a case in which he had performed the operation with complete restoration of the use of the eye, although at the time of operation it was lying on the cheek, thrust out from between the lids, and with mere perception of light.

Pathology of Glaucoma.—Mr. Story gave a demonstration of the experiments of Czermak and Birnbacher relating to the osmosis of fluids through tubes with permeable walls within a closed chamber. (Vide O. R., June, 1887, p. 173.)

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BERLIN (Stuttgart). A Particular Kind of Word-blindness (Dyslexia). *Bergmann, Wiesbaden*, 1887, *pp.* 74.

The disease, called by Prof. Berlin dyslexia, is, he believes, closely allied to the alexia or word-blindness of Kussmaul, differing from it probably only in degree. He admits that the names alexia, paralexia, and dyslexia are founded on a philological mistake, but he considers that the mistake has gained such footing in medical nomenclature that it cannot be disturbed except at great loss, and he knows no convenient synonym to express the condition.

He commences his monograph with an account of six cases, collected during a period of twenty-three years. All six cases had this peculiarity—that they could read aloud, of average type, say Jæger 3 to 5, only a few words in succession. These words were quite correctly spoken without confusion or stammering, but so soon as a few words had been read the patients handed back the book as if anxious to get rid of it, and on being questioned it appeared that they did have an unpleasant feeling, a sort of unwillingness which they could not define. On being urged they would take the book and again read a few words, but again hand it over with the same manner, and by no urging could they be prevailed on to read continuously from any type. There was precisely the same difficulty when the patients read "to themselves" as when they read aloud, but ordinary oral conversation was perfect.

1.—The first case, a man of 66 years of age, was seen by Prof. Berlin, in 1863, on account of difficulty of reading. The difficulty was of the character above described, had come on suddenly, and was not explained by any ocular defect such as defect of accommodation or weakness of convergence. He had about 5 D. of myopia, but it made no difference whether the type was large or small. About half a year later he developed certain cerebral symptoms unknown to Prof. Berlin, and died from an apoplectic attack.

2.—The second case, also a man aged 59 years, had been attacked, in 1879, with palpitation and dyspnœa while ascending a hill. Next day he had a passing darkness before his eyes and

saw double, and although this passed off there remained a difficulty in using his eyes. The difficulty proved to be dyslexia. Here again vision was good, a moderate degree of myopia being present, but no other ocular abnormality. After about a month the condition had disappeared, and the patient could again read the newspaper. Four years later, however, he began to have apoplectiform attacks, in which he was unconscious and had tonic and clonic convulsions, the body on one occasion being turned strongly to the left. There was also some mental confusion and difficulty in finding the proper word, but on no occasion did there remain any paralysis or unilateral weakness. The attacks went on till, in 1884, he died, apparently in one of them. The autopsy showed extensive atheroma of the cerebral vessels, old thrombus in the posterior cerebral and posterior communicating arteries of the left side, extensive hæmorrhages in both hemispheres, especially the left, bursting into the ventricles. The heart was hypertrophied, and the aorta much deformed by atheroma.

3.—In the third case, a man aged 75 years, the dyslexia set in suddenly after a year of vague cerebral symptoms, weakness, and loss of memory. It was accompanied by a numbness in the lower extremities and a slight degree of aphasia. The aphasia improved considerably, but there remained the dyslexia and numbness, with some awkwardness in the use of the right hand. The diagnosis in this case was further complicated by commencing cataract in both eyes and right hemianopia. The hemianopia, however, was a considerable distance from the fixation point in both fields, specially the left, which had also the better lens, so that L. read Jæger 6, R. read J. 14. After a few months both aphasia and dyslexia disappeared, and for a year the patient remained in fairly good health, when he died of facial erysipelas with no return of his nervous symptoms. The autopsy showed no naked eye change in any part of the brain, only a very marked atheroma of the left middle cerebral artery down to its smallest branches, but no thrombosis of this or any other vessel.

4.—This patient, a man aged 29 years, had had syphilis with secondary symptoms seven years before. The dyslexia was accompanied by deliberateness of speech, but was present apart from speaking even when the patient read "to himself."

Inunction and iodide of potassium were used vigorously but without benefit, and soon marked symptoms of general paralysis showed themselves, with which he died a year later. The autopsy showed the pathological changes of general paralysis, a chronic meningo-encephalitis.

5.—In the fifth case, that of a lady aged 63 years, the attack was accompanied by giddiness and headache, and was typical in character. There was slight albuminuria. Vision was good, and there was no pathological appearance in the eyes. Speech also was unaffected. A diagnosis of cerebral hæmorrhage or embolism was made. The condition slowly improved till the end of the same year, when she had a severe apoplectic attack, causing general convulsions but leaving no paralysis. This was soon followed by another, affecting the left side and leaving paralysis. Two years after the first attack she died apoplectic, but no details were obtained.

6.—The sixth case was that of a man, aged 43 years. The right eye was practically blind from an old episcleritis, but the vision of the left eye was good, except for a red-green scotoma, said not to have existed previously. The dyslexia was typical, and was accompanied by headache and giddiness, although it was impossible to be certain that these latter did not depend on a perforation of the membrana tympani. The left eye began to suffer from episcleritis, and he began at the same time to have repeated apoplectic attacks affecting the right side. A diagnosis of syphilitic endarteritis was made, and under mercurial inunction and potassium iodide the symptoms, both ocular and other, very much improved ; leaving, however, slight weakness of the right extremities and a slight degree of aphasia. The dyslexia disappeared. Three years after the attack first mentioned he had much headache, dyspnœa, and albuminuria. He became completely aphasic, and died comatose. The autopsy showed cardiac hypertrophy with disease of the valves, renal embolisms, and in the brain a large softening involving the base of the left hemisphere below the third temporo-sphenoidal convolution ; also much disease of vessels and adhesion of the pia mater in the region of the lower extremity of the fissure of Rolando.

Near the middle of the right lenticular nucleus was a small cyst containing clear fluid, and there was on the left side

softening (1) of the area lying behind the ascending limb of the fissure of Sylvius and above its horizontal limb, (2) of the third temporo-sphenoidal convolution, and (3) of the left cerebellar lobe.

While several of these cases were observed for only a short period, and several were in various ways complicated, Prof. Berlin considers that they are sufficient to render it practically certain that dyslexia is a real type of cerebral disease. He distinguishes it from asthenopia by the absence of confusion of the letters or pain in the eye, by the shortness of the period of reading, by the severity of the disturbance of reading, and especially by the complete absence of any of the ordinary causes of asthenopia. While there were ocular abnormalities in several of the cases, the affection was in each case almost certainly independent of these. In favour of this we have the suddenness of the attack and its being accompanied by headache and giddiness, pointing definitely to cerebral disease. Still more cogent proof lies in the occurrence of symptoms of focal lesions, hemianopsia, aphasia, sensory and motor disturbances of the extremities, and unilateral facial convulsions, these last occurring chiefly in the form of apoplectic attacks. Summing up the localising indications from these symptoms it is clear that the lesion is a left-sided cerebral affection, and with this the results of *post-mortem* examination agree, although in several cases the lesions were diffuse. The lesion in the sixth case recorded above corresponded closely with the position of the lesion as diagnosed hypothetically by Berlin in his first case, but in accordance with the fact that motor aphasia was present the lesion extended as far forward as the ascending limb of the fissure of Sylvius. Posteriorly, again, it did not involve the angular convolution to the extent supposed by Berlin. The area involved in dyslexia may be taken, therefore, to correspond with Ferrier's visual centre. In Berlin's sixth case there was lesion, not only of this area but also of the third temporo-sphenoidal convolution of the left cerebellar lobe and of the right lenticular nucleus. Berlin gives reason for believing that these lesions played no essential part in the causation of the dyslexia. He quotes a case of dyslexia recorded by Nieden (Archiv. für Augenheilk., Bd. XVIII., p. 162), in which the lesion consisted of three hæmorrhages in the left corpus

striatum. This patient, if urged to read, showed symptoms reminding Nieden of the terror of hydrophobic patients, and even had something like a syncopal attack. He improved sufficiently to be able to read a few lines at a time, but died of gastric catarrh with asthenia. The hæmorrhages did not directly involve the cortex; the two older were anterior and involved the fibres leading from the area posterior to the third frontal convolution. An eighth case of dyslexia resulting from tumour is also quoted by Berlin, with autopsy.

Dyslexia, then, according to Berlin, is to be regarded as symptomatic of a focal lesion in the left cerebral hemisphere in the neighbourhood of Broca's area, and is prognostic of severe and probably fatal cerebral disease, the disease generally consisting of extensive vascular disease causing either permanent disease or more or less severe disturbance of nutrition of the "reading centre" or the paths leading to it. The treatment is of course that of the disease which has caused the vascular degeneration, and gives but little hope of success except in the case of syphilis, and even here the prognosis must be guarded as shown by one of the above recorded cases. General hygienic treatment, attention to diet and to bodily and mental rest, may do much to ward off the apoplectic attacks from which ultimately the patient will probably die.

E. Jackson (Philadelphia). When and how to use Mydriatics in the Eye. *Reprint from "The Polyclinic."*

This is a useful and practical article on the use of mydriatics for diagnostic and therapeutic purposes. The *contra-indications* are noted first. The chief of these is the presence of glaucoma, and the danger of making a mistake is of course greatest when the disease is incipient or latent. In this matter the author makes a "possible exception" in favour of cocaine, but it should be remembered that several cases are already on record in which an outbreak of glaucoma was apparently induced by the use of cocaine, and there is good reason to believe that while the action of this drug upon the vessels tends to lower the tension of the eye, its action upon the position of the iris may under predisposing conditions tend to induce glaucoma, just as in the case of other mydriatics.

A second contra-indication is the interference with vision, which a mydriatic causes. A third is the presence of a perforating ulcer at or near the corneal margin.

With regard to the choice of a mydriatic, and the mode of employing it for various purposes, the author's conclusions may be summarised as follows:—

Simply to dilate the normal pupil, a single drop of either of the following solutions suffices:—

> Cocaine hydrochlorate, gr. j, water, ♏ xxv,
> or about 1 to 25;
> Homatropine hydrobromate, gr. j, water, f ℥ j,
> or about 1 to 500;
> Atropine sulphate, gr. j, water, f ℥ v,
> or about 1 to 2,500;
> Duboisine sulphate, gr. j, water, f ℥ x,
> or about 1 to 5,000;

or daturine, hyoscyamine, or hyoscine salts used, of the same strength as duboisine.

Of the above the homatropine solution renders the pupil rather the most rigid, and its effects pass off in from twenty to fifty hours, but *cocaine is the most generally valuable dilator of the pupil.* The dilatation it produces lasts but ten or twenty hours, is never so great in strong as in feeble light, so that there is less annoyance from exposure to the light; it produces proportionately the smallest impairment of accommodation; and the dilatation it produces can be promptly overcome by the use of eserine, making it especially valuable after middle life, when there is a chance of the occurrence of glaucoma. And this drug has yet another advantage. In spite of the readiness with which it yields to myotics, in spite of its inability to entirely prevent the reaction to bright light, tested in a weak or moderate light, *cocaine produces a wider dilatation of the pupil than any other mydriatic.* And this superior power of cocaine is especially manifest in old people, whose pupils often do not dilate well under other mydriatics.

To completely paralyse the accommodation from two to five instillations of a drop of either of the following solutions usually suffice:—

> Homatropine hydrobromate, gr. x, water, f ℥ j,
> or about 1 to 50;
> Atropine sulphate, gr. iv, water f ℥ j,
> or about 1 to 120;
> Duboisine sulphate, gr. ij, water f ℥ j,
> or about 1 to 240;

or daturine, hyoscyamine, or hyoscine in the same strength as duboisine. Homatropine should be instilled at intervals of from five to fifteen minutes; with the other mydriatics, to avoid constitutional effects, the intervals must be much longer. Cocaine in any strength cannot, in most cases, completely control the accommodation.

Of the above, for diagnostic purposes, homatropine is to be preferred. It reduces to a minimum the period of disability for eye work, recovery from it being nearly complete in from thirty-six to forty-eight hours against five or six days for duboisine or ten or twelve days for atropine. It causes no noticeable and distressing symptoms, like the dryness of the throat, flushing of the surface, incoördination of motion, or even delirium, which are liable to follow the use of the other mydriatics, although it does usually to some extent influence the action of the heart.

When as a therapeutic measure the power of accommodation is paralysed, such paralysis should always be made complete. Strain of accommodation occurs when the power of the ciliary muscle is insufficient for the performance required of it, and it is irrational to lessen still further its power while still requiring it to do some work, as inevitably happens when an eye is placed partially under the influence of a mydriatic. If you use a mydriatic to relieve strain of accommodation, use it so that complete paralysis of accommodation will be secured as soon as possible, for only then does accommodative effort cease. The difficulty of producing complete paralysis of accommodation does not greatly diminish with the approach of the age at which the power of accommodation is lost. The strength of solution required is not materially less at 45 than at 15, and this is not surprising when we remember that accommodative power is lost primarily by increased resistance in the lens rather than diminished power in the ciliary muscle. Homatropine is inferior to atropine or duboisine where the influence over the accommodation is to be long maintained; for after each instillation of the former, recovery of ciliary power will begin within two or three hours, and the instillations must be repeated at least that often, to prevent the alternation of periods of accommodative strain with periods of rest. With the other mydriatic solutions

recommended for this purpose, at least eight to twelve hours elapse before there is any noticeable lessening of the influence of the drug, so that three instillations a day will be sufficient to uniformly sustain their action.

To dilatate the Pupil in Incipient Cataract, one of the weaker solutions of atropine, duboisine, etc., applied once, every one, two, or three days, is sufficient ; cocaine not being well suited to this purpose on account of the evanescence of its action, and its inability to maintain dilatation against a strong light.

To maintain dilatation of the Pupil against a Congested or Inflamed Iris, or to break Iritic Adhesions, one may employ the following, or even stronger solutions :—

> Atropine sulphate, gr. j, water, f ʒ j, or 1 to 60 ;
> Duboisine sulphate, gr. j, „ f ʒ ij, or 1 to 120.

Here we wish to develop the maximum effect of the drug upon the iris, and the instillations should be repeated at short intervals, say every half-hour or hour, until the pupil becomes fully dilated, or the symptoms of mydriatic intoxication become so pronounced that the use of the drug can be pressed no further.

To get the maximum effect on the eye with the least absorption of the drug into the general system, as little of it as possible must be permitted to enter the tear passages, and find its way to the mucous surfaces of the nose and throat. To hinder such escape of the solution. the nasal extremities of the lids, including the canaliculi, may, as is often recommended, be firmly pressed against the nasal process of the superior maxilla. But it is more effective to evert the lachrymal puncta, and keep in contact with the adjoining surface a bit of absorbent cotton, and to place but a single small drop upon the cornea at once. When larger amounts of fluid are instilled, a greater proportion runs off with the tears. When both eyes are affected with iritis, it is sometimes wise to concentrate the mydriatic attack upon one of them one day, and upon the other the next ; in order to get the full force of the drug in tearing loose adhesions. The power of atropine or duboisine in this direction may be supplemented by the simultaneous use of cocaine ; though on account of its

effect on the cornea, the applications of cocaine should not be continued more than a few hours, nor repeated before the second or third day.

The importance of using these drugs freely in the class of cases last mentioned is of course beyond dispute, but we think a false idea is apt to be conveyed by such expressions as "the full force of the drug in tearing adhesions loose." When the sphincter of the iris and the ciliary muscle are completely paralysed, and the blood vessels contracted, the drugs have done all they can do towards separating the adhesions; nothing further is gained by increasing the strength or the frequency of the application. Dilatation of the pupil is effected by the physical elasticity of the elastic lamina of the iris, and mydriatics promote this action simply by paralysing the antagonistic forces; they have, so far as we know, no power to do more than this.

E. MEYER (Paris). A Practical Treatise on Diseases of the Eye. Translated by Freeland Fergus, M.B., Ophthalmic Surgeon to the Glasgow Royal Infirmary. *London: Griffin & Co.*, 1887.

This is a work of 637 pp.—an excellent translation of a standard French textbook, which has, the author tells us in the preface, passed through three French editions and four German, and has been translated into Italian, Spanish, Polish, Russian, and even Japanese. This fact alone raises a presumption in favour of the work, and we expect to find that it has some substantial merits. This expectation on the part of the reader, we may safely say, will not be disappointed. He must not turn to it for enlightenment as to minute points of the anatomy or physiology of the eye, or even for anything like a full presentation of the relations of the eye to the central nervous system. These are evidently, and perhaps rightly so, considered as points lying beyond the scope of the work. If, however, a practitioner has taken his share in the work of the ophthalmic department of his hospital, or has attended for some period the practice of a special ophthalmic hospital, and wishes to have beside him a treatise to which he can refer for advice as to the diagnosis and treatment of the ordinary diseases of the

eye, we can cordially recommend to him Dr. Meyer's work. It is essentially a practical work, and shows on every page evidence of the fifteen years' active experience since its first publication.

The strength of the work lies, as might be expected, on its more purely surgical side. The descriptions of the operations are most full and detailed, with numerous practical hints and cautions as to methods of procedure and after-risks. This detail will, we doubt not, make the work interesting to operators in this country, who will find here variations from their own methods, some at least worthy of adoption. On its more medical or general side, however, we think Dr. Fergus will do well to strengthen the work in future editions. While, for example, we have 57 pp. devoted to cataract operations, we have only a bare passing reference, easily overlooked, to diabetes as a cause of cataract and retinitis. We fail to find any account of the special characteristics of these, and their significance as symptoms. The results of medical ophthalmology established by Leber, Gowers, Mackenzie, and others might, we think, in a future edition be more explicitly and separately expressed than in the present edition, seeing that the work will undoubtedly be used by many general physicians and surgeons.

The account of the refraction and accommodation of the eye, their anomalies and correction by lenses, of the ocular muscles and their paralysis, of strabismus and its treatment, is admirably clear, neither overburdened with theory nor dogmatically empirical. We would venture to say, however, that by the mode of examining the pupil recommended at p. 7—that, namely, of closing the eyelids and suddenly opening them—it would be impossible in a large proportion of cases to reach a satisfactory conclusion.

The work is eminently readable, without trace of awkardness of idiom, or of the slovenly composition generally found in the best translations. The publishers have done their part in the tasteful and substantial manner characteristic of their medical publications. The type and the illustrations are in marked contrast to most medical works. The latter include three coloured plates from Liebreich's "Atlas of Ophthalmology," and are almost without exception of a high order of excellence.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, JUNE 23RD, 1887.

HENRY POWER, M.B., F.R.C.S., in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

Anatomy of the Capsule of Tenon.—Mr. Lockwood exhibited a series of specimens from the museum of St. Bartholomew's Hospital. They showed the continuity of the capsule and the sheath of the optic nerve behind, and its relations to the conjunctiva in front. The suspensory ligament of the eye and its attachments to the wall of the orbit were seen from different points of view. The intra-capsular ligaments of the various muscles and their relation to the recti were demonstrated, and also the inward bend of the superior rectus. Attention was drawn to the tunica adventitia oculi, and to the check ligaments of the recti. The latter might be of considerable importance in relation to squint operations.

Mr. Power spoke of the importance of an accurate knowledge of the precise attachment of muscles, and of the precise effects of division of tendons. Everyone must have experienced unexpected and unexplained instances of failure in the treatment of cases of squint.

Discussion on Toxic Amblyopia.—Mr. Nettleship, in reference to the question of alcohol, said he had met with no instance of amblyopia in drinkers who did not smoke, but he thought that in smokers alcohol might contribute in determining the onset and the degree of the affection. He instanced the case of a man who smoked from $\frac{1}{4}$ to $\frac{1}{2}$ oz. of mild tobacco a day, and whose vision failed not long after he had taken to drinking; and also another case of a man, aged 49, suffering from alcoholic paralysis, who was a large smoker, but had no central defect for colour; his vision improved very materially when he partly left off drinking and smoking. Cases seeming to show that alcohol had no effect were common, that is, where the leaving off tobacco was sufficient to effect cure or improvement, the alcohol being indulged in in undiminished quantity. Considerable permanent pallor of the whole disc was common in severe cases and might persist, though the vision improved.

There were also certain forms of central amblyopia in non-smokers. There was a hereditary form in which families of young adult males got amblyopia rather rapidly, some being smokers and some not. Apart from this class he had only seen two cases of central amblyopia not attributable to tobacco. One was in an old man of 72, who had not used tobacco for twenty years, and whose sight had been failing for eight years; his discs were rather pale and arteries diminished; he remained in *statu quo*. The other patient was a man of 24, whose sight failed whilst he was extremely ill with syphilitic rupia; there were no ophthalmoscopic changes, but a scotoma exactly as in tobacco cases; he had not used any tobacco for eight months, and his sight had only begun to fail three months after he left it off. He had met with tobacco amblyopia in a man who only smoked $\frac{3}{4}$ oz. of shag a week. As to the length of time a person must have been a smoker, he instanced the case of a man who took to smoking at the age of $29\frac{1}{2}$, consuming 1 oz. of shag daily; he was also a heavy drinker; at the end of six months he took the pledge and kept it for six months, and between two and three weeks later his sight began to fail. In another instance, a man, aged 52, had characteristic central amblyopia after being a smoker for three years. He had met with tobacco amblyopia in both father and son once, and once the son of a patient was found to have locomotor ataxy and progressive atrophy of his discs. In two patients (sailors) there was a history of an attack of night-blindness whilst at sea some years previously. He had only met with one instance of a second attack; the patient had been cured by giving up tobacco, and then took to it again four years later; at the end of another year his vision again failed. In his experience cases might recover with complete or partial disuse of tobacco. Sometimes cases did not progress beyond a certain point, although smoking was not discontinued.

Mr. McHardy referred to the case of a gentleman, aged fifty-two, who had commencing cataracts, which had been supposed to be the cause of his failure of vision. When tobacco was given up he made marked improvement in twelve weeks, and in four months had good colour vision. He believed that severe nervous or mental shocks frequently influenced these cases; he did not believe that the intermission of tobacco in those habituated to it had anything to do with

the causation. All tobacco must be stopped, and he was strongly in favour of giving strychnine; it must be given to produce its full effects, and then decided improvement would be noticed in a few days; by the end of ten or twelve weeks all the recovery possible would have taken place, and most cases did recover completely. A considerable proportion of his patients had suffered from malaria. He had never seen tobacco amblyopia under thirty-two years of age; most of the patients were between forty and fifty.

Mr. Edgar Browne: In Liverpool, the cases were difficult to trace, most of the patients being sailors. He had met with one instance of relapse, but he thought that perhaps the rarity of relapses was only apparent, inasmuch as the patient would know what to do, and so would not come again for advice. As a rule the patients did leave off smoking for a time, and if they returned to it it was to a milder tobacco. He had seen no case of amblyopia due to alcohol alone, and he had seen no case in women, a strong point against the alcoholic theory, as women drank just as freely as men, but did not smoke. Of his forty-nine patients, seventeen were heavy drinkers, four teetotallers. Persisting pallor of the disc was the rule, notwithstanding improvement in sight. He had seen one case in which the blindness was permanent, but there was a history of a blow, and he thought there might have been some true atrophy in that case. The affection was common about thirty, but most common between forty and fifty. He believed that some impairment of general health always preceded the onset, and in sailors there was always the great change in habits as a factor. The lowest quantity he had ever known to cause it was a daily allowance of two ounces of twist. He had tried nitrite of amyl, but only once with benefit; in that case, when the face was flushed, there was a temporary improvement of vision.

Dr. Hill Griffith: Of twenty-seven patients who completely recovered, eleven had entirely given up tobacco; the others had reduced the quantity. Of twenty-four in whom partial recovery had taken place, eleven had entirely discontinued the tobacco, and nine had lessened the quantity; in one woman a relapse took place during the treatment, because she took to smoking again. Of eleven failures, five patients had entirely

given up tobacco, and two had made no reduction. Of the three who had got worse, two had smoked as usual all along; the other had given it up. Therefore there was a tendency to recover even without complete disuse of the drug, as one-third of his patients had only reduced the amount taken. He had not met with atrophy of the disc He had seen five cases not dependent upon the use of tobacco: the first patient was a woman much pulled down by repeated pregnancies, who did not smoke, and whose impairment of vision was exactly like that seen in purely functional cases; the second was also a woman, a heavy drinker, who did not smoke; she made a rapid recovery; the third was also a drinker, who did not smoke; the fourth had been a smoker, and was a drunkard; he had amblyopia, but no central scotoma; the last patient, like the first, had contracted fields and resembled a functional case. He had seen fourteen instances in women, and had met with two cases in men under twenty-three. From five to six years' smoking was the shortest period by which he had known the disease to be produced. He had seen hæmorrhages in several cases, all in heavy drinkers.

Mr. Adams Frost had not met with a case of central amblyopia without tobacco. He had seen one case of non-central amblyopia in a lady who did not use tobacco; it might have been consecutive to typhoid fever. None of his patients were total abstainers, and some were heavy drinkers. All improved, and recovery usually took place in from six weeks to three months. The youngest was 25. He had no faith in strychnine, but found iodide of potassium very useful.

Mr. Lawford, jointly with Mr. Edmunds, referred to a fatal case of alcoholic paralysis in a man aged 56. On examination, changes were found in the optic nerves; these were central higher up, and lower down sector-like, and only at the outer side. They did not believe the changes ought to be attributed to the alcohol, but rather to tobacco. Unfortunately, no examination of the patient's sight had been made during life.

Mr. J. Hutchinson, Junr., mentioned one case of amblyopia apparently due to alcoholism, in a heavy drinker, aged 42, who made a rapid improvement. He had once seen the affection appear in one eye six months before the second began to fail; the patient smoked ½ oz. of shag daily; the eye which had

failed first was the first to improve. He also mentioned the case of a man, aged 63, in whom the onset was gradual, and who had a large central scotoma, whose distant vision was bad, whilst his near vision was good; he improved. Strong tobacco was usually the cause, but he had one case where a daily allowance of an ounce of May Blossom had caused it, and one where cigars only had been used. He thought it fairly common to find a scotoma in the yellow field, and had once met with a scotoma for all four colours. In two cases there had been a scotoma for white; in one case the scotoma was wholly absent for a time.

Mr. Jessop had found a history of tobacco-use in all the cases he had seen, and of strong tobacco in all but one. In most of them he thought there had been some sort of worry or trouble. In alcoholic paralysis there was no central scotoma or limitation of the field of vision. He had seen the affection in two women, both smokers.*

Mr. Morton had only seen this amblyopia in tobacco cases. Three teetotallers recovered after giving up tobacco. In one case of persistent pallor of the disc that he had long under observation, the vision remained stationary for several years. Once he had seen retinal hæmorrhages. He had not found shock play any part in the causation. Strychnine was useful in his experience. He had seen two cases in men under 23. Shag was the tobacco that most frequently caused it.

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* In the "Boston Med. and Surg. Journal," April 22nd, 1886, Dr. Myles Standish published a remarkable case of alcoholic paralysis preceded and accompanied by amblyopia *ex abusu*. The patient was a physician who had used both alcohol and tobacco in excess. The amblyopia began as a central colour scotoma; later, during the onset of alcoholic paralysis, there was, on more than one occasion, absolute loss of light perception in both eyes, with widely-dilated and inactive pupils, white discs, and contracted retinal vessels; later still, when a considerable degree of recovery from the general symptoms had occurred, V rose to 20-100ths, and this was retained, although for some months tobacco was again used in excess; alcohol, however, was given up entirely. The other symptoms, which were various and severe, were typical of a multiple neuritis. The author infers that the amblyopia produced by tobacco is due to a process of this same nature; that alcohol plays a large part in the production of this amblyopia, which he therefore calls amblyopia *ex abusu*, instead of tobacco amblyopia; and that in cases of alcoholic paralysis, impairment of vision, with central scotoma, might be more frequently found if looked for.

Mr. Gunn.—The age was most frequently from 35 to 55. The failure of sight was often sudden and rapid, and he thought it occurred more often in those engaged in open-air occupations. He had known half an ounce daily of coarse tobacco cause it. In all cases tobacco had been used, and he believed that both total abstainers and drunkards were more liable to it than moderate drinkers. Only one patient did not recover on leaving off tobacco; considerable improvement followed on lessening the quantity of tobacco used. One patient had been a smoker for fifty years. He had seen one case of late recovery with imperfect vision and persistent pallor. He had never met with a second attack. In a diabetic a very small quantity of tobacco would give rise to it.

Mr. Critchett mentioned the case of a youth who, from 16 to 18 years of age, smoked half an ounce daily. The symptoms were very marked, but complete abstention from tobacco brought about his recovery in three months.

Dr. Little referred to a case of amblyopia from bisulphide of carbon. The patient had been employed in the curing room of some rubber works for three months when he found his sight failing, and three months later he had extreme failure of vision. The optic discs were pale and hazy; the vessels narrowed; the fields for white and blue contracted, those for red and green absent; smell and taste were numbed, and hearing was affected on one side. A year later, after abstention from his work, he had almost normal vision. In another case there was normal vision and no scotoma, but all the fields were contracted. He also recovered.

Mr. Power thought that there was still much to be made out by inquiry. He thought that tobacco did not produce these poisonous effects until digestive disorders and anæmia were already established. Many conditions had to be thought of, and he mentioned a case where a searching inquiry brought to light an attack of typhoid fever, as well as a history of excessive drinking and syphilis. He thought that strychnine and iron were of very great advantage in these cases.

Friday, July 8th, 1887.

Jonathan Hutchinson, F.R.S., Vice-President, in the Chair.

Reported by John Abercrombie, M.D.

Ophthalmoplegia.—Mr. J. Hutchinson, jun. Results of a *post mortem* examination on a case of ophthalmoplegia externa and interna, with clinical notes by Dr. Robinson, under whose care the patient had been. Besides almost complete paralysis of the oculo-motor nerves of the right eye, the man had persistent pain in the forehead and temple, some proptosis and congestion of the lids, and considerable defect of vision. Chronic inflammation about the right cavernous sinus had produced neuritis of all the nerves in its wall, had obliterated the venous canal, and had led to partial obstruction of the carotid artery, and adhesion of the apex of the temporo-sphenoidal lobe to the dura mater. The lesion was in all probability syphilitic. He related two other precisely similar cases of one-sided ophthalmoplegia externa and interna, with recovery under the use of iodide of potassium. He suggested that the same lesion, syphilitic inflammation about the cavernous sinus, was also in these the cause, and laid stress on the fact that the sixth nerve (lying furthest away from the wall of the sinus) being involved the latest and to the least extent, and also the involvment of the ophthalmic division of the fifth nerve (shown by severe frontal pain or anæsthesia), pointed to this view of the pathology rather than to central nuclear degeneration. Another case of ophthalmoplegia interna with ptosis was related; in that instance, probably, the disease had a central origin. Finally, a case of double ophthalmoplegia interna in a young man was related. In all there was either a distinct history of syphilis, or good reason to suspect its presence. The occurrence of some protrusion of the affected eye and congestion of the lids, etc., were symptoms pointing to disease of the cavernous sinus; the condition of the retinal veins might possibly also be of assistance.

Double Ophthalmoplegia Externa. — Mr. Lawford. The patient was a healthy man, aged 60, who had had almost complete ptosis for ten years. The eyes were almost fixed, there being scarcely appreciable movement in any direction. The internal ocular muscles were unaffected, and the condition

of the fundus was normal in each eye. There was no history of syphilis, and no other sign of cerebral or spinal disease.

Mr. Hutchinson said that Mr. Lawford's case was typical of the symmetrical form of ophthalmoplegia externa, in which it persisted without any complication or extension. When the disease was symmetrical throughout its whole course, it was probably central, and always, or nearly always, due to syphilis. He had seen a case almost exactly similar to that of Mr. Lawford, of twenty years' duration, in a gentleman who enjoyed good health, but had had syphilis. Another case was almost conclusive against syphilis. The patient was a young lady in good health, in whom the disease was very gradual. Another case appeared to be due to injury, and recovery to a considerable extent took place. Paralysis of a single ocular nerve was common in locomotor ataxy; the disease was not symmetrical, came on quickly, and almost always got well. It was probably due to syphilitic neuritis, and not to central disease; sometimes recovery in these cases was spontaneous. The other group was quite distinct; the disease was symmetrical, all the muscles were affected, the disease was very gradual, and recovery did not ensue. His son's case was interesting in that syphilitic disease of the veins was rare. He thought it would be convenient if the two groups could be given different names, but could not suggest any. He had seen one completely unilateral case due to an aneurysm of the carotid pressing on the cavernous sinus. In conclusion, he asked whether there were any different means of recognising thrombosis of the cavernous sinus apart from neuritis or periostitis in the orbit.

Dr. Mules mentioned the case of a young married lady who developed ophthalmoplegia interna and externa consecutively, first in one eye and then in the other, who died with symptoms of basic meningitis from general miliary tuberculosis.

Mr. Mackinlay confirmed Mr. Hutchinson's observation that in the unilateral form in ataxic cases recovery was complete often without iodide of potassium.

Dr. Ord agreed with Mr. Hutchinson that the symmetrical cases were permanent and intractable, and that the others were very commonly curable.

Dr. Coupland found that Mr. Hutchinson, jun.'s observation substantiated the paper he had read on thrombosis of the

cavernous sinus earlier in the session. In the majority of cases where the sinus was diseased, the other side became involved. He thought that many of the cases were certainly due to lesion in the sinus.

Dr. Anderson believed there was a form of unilateral ophthalmoplegia externa which was central and incurable. He mentioned a symptom in these cases which he thought would be of value; when the lid of the affected side was raised, the sound one drooped to a corresponding amount, and rose when the other was allowed to fall. In one case, when the affected eye was covered, the healthy lid descended.

Mr. Hutchinson, jun., was not certain that in his case the disease had started in the sinus: it involved the structures in the vicinity, and might have begun there. He thought that the classification would be a great difficulty in regard to a fresh nomenclature. He could not speak positively as to the condition of the retinal veins.

Mr. Lawford believed that, in his own case, the disease was central and of fairly wide extent.

Quinine Amblyopia.—Mr. Nettleship. Two cases of temporary loss of sight from internal administration of quinine. One was of special interest because the patient had an idiosyncrasy to the drug, which, even in small doses, caused gastric derangement, and on two occasions brought on temporary failure of sight. The second case was a good classical instance of quinine amblyopia.

Mr. Doyne asked whether there was any change in the size of the arteries. He had seen a case in which blindness was attributed to quinine, where the arteries were very much contracted; eventually the discs became whitened, but vision was fairly regained.

Mr. Nettleship thought that during the stage of amblyopia the arteries were always contracted. He believed that no case of complete permanent blindness from this cause had been recorded, but recovery might be accompanied by small fields and contracted arteries.

Mr. Hutchinson thought that the subject of visual troubles arising from food or drugs was one of great interest. He had seen one case in which transitory deafness had clearly been due to coffee.

Sympathetic Ophthalmitis after Evisceration.—Mr. Cross. Two cases: G. R., aged 40, came with wound of left eye-ball over the ciliary region, but free of the cornea, occupied by slight choroidal protrusion; iris inflamed, pupil tied, lens had escaped. The wound had been made ten days before, and vitreous had escaped. Seventeen days after the accident, evisceration was done antiseptically under the spray, and a glass vitreous introduced. The operation relieved pain, but was followed by considerable swelling of the lids, and discharge. Conjunctival chemosis continued for some time; as this subsided, the glass ball was seen exposed; scarcely any discharge, and no discomfort. Nothing was complained of or suspected in the right, until seventeen days after the operation, when patient had dull vision and discomfort in the eye. Two days later there was distinct sympathetic ophthalmitis. The ball was removed at once, leaving the sclerotic a rigid hollow cup which moved freely like the opposite eye. The eye was much inflamed and painful for a fortnight, and he left five weeks after removal of the ball, some circumcorneal injection and irritation remaining. Patient was recently seen again, and the eye was perfectly normal; no uvea on the lens. J. L., aged 50, seen three months after wound of right cornea. Cornea and eye chronically inflamed; there was iridic prolapse. Other eye quite healthy. Evisceration and metal vitreous. Considerable inflammatory swelling and discharge lasted a week. Twelve days after the operation the ball was exposed through a small fistula; it was at once removed. In ten days the patient left. In a few days he returned, saying that, after a short exposure to sunlight on the day he left, he found the sight impaired. Vision $\frac{20}{40}$ J4.; slight circumcorneal injection; sluggish pupil, which yielded to energetic atropisation, leaving slight uvea; vitreous hazy; distinct neuro-retinitis. Gradual improvement followed. In this case the sympathetic ophthalmitis showed itself twenty-one days after operation, and four months after the injury. The symptoms subsided after ten weeks' treatment. These cases were considered to be analogous to those of sympathetic ophthalmitis occurring after and in spite of enucleation, and not caused directly by the operation. A case was quoted where a child aged 13 years had her eye removed sixteen days after a corneal wound. Forty-two days

after the injury, and twenty-six days after removal of the eye, slight sympathetic ophthalmitis came on, but recovered after two months' treatment. He considered that enucleation was superior to evisceration when sympathetic ophthalmitis threatened; it more thoroughly removed the exciting disease, gave earlier and more complete physiological rest, and thus tended without delay to resolution of the morbid process where this might have advanced beyond the part removed. There was a special danger from the incomplete inclusion of the artificial vitreous. A septic fistula might result from imperfect healing, or, later on, from wearing out of the conjunctiva between the false eye and the artificial vitreous.

Dr. Mules said that nothing was claimed for evisceration over enucleation in regard to sympathetic ophthalmitis. He believed that these two cases were the only recorded instances of this sequence. The first case he regarded as one of ordinary iritis, as there had been no descemetitis, and the man was well in ten days; chronicity was essential in sympathetic serous iritis. There was no clinical difference between non-traumatic serous iritis and sympathetic ophthalmitis. The second case was undoubtedly one of sympathetic disease, but it did not come on until four months after the accident. He incidentally mentioned that the horsehair-drain and ice-bag did away with the pain.

Mr. Doyne protested against evisceration being adopted in cases of tumour.

Mr. Brailey agreed with Mr. Cross that these were instances of sympathetic ophthalmitis, and said that in many cases the inflammation was of mild form, and disappeared quickly. Descemetitis was not essential, and at any particular time the dots might be absent. He had performed evisceration in several cases with good results, and had not put in a glass ball. He did not perform the operation when choroidal inflammation existed.

Mr. McHardy regarded these cases as instances of true sympathetic ophthalmitis. There must sometimes be an early stage and mild form of that disease. Mr. Cross had, he held, obtained his brilliant results by removing the exciting cause.

Mr. Cross held that evisceration was an excellent operation in certain cases, but it was not good when there were symptoms

of sympathetic ophthalmitis. He was certain that his cases were instances of sympathetic ophthalmitis. The globe did not quite heal over, and this had some share in the causation.

Living and Card Specimens.—Mr. Spencer Watson: (1.) Sequel to a case of Hæmorrhagic Glaucoma; (2.) Case of Serpiginous Nebula of Cornea.

Mr. R. N. Doyne: A New Optometer.

Annual General Meeting.—The business of the annual meeting was taken at 9.30. The report of the Council showed that the Society now numbers 205 members, 29 of whom are non-resident; 3 members had died since the last annual meeting, and 14 new members had been elected. Reference was made to the fact that the last Bowman lecture had been delivered by Professor Zehender, of Rostock; and that Mr. Henry Power had kindly undertaken to deliver the next. The library was reported to be in a very flourishing state, many donations having been made, notably that of a series of von Graefe's Archives, down to the year 1875, by Mr. James Dixon. The Treasurer presented his annual report.

AMERICAN MEDICAL ASSOCIATION.

Section on Ophthalmology.

Meeting held at Chicago, June 7th, 8th, and 9th, 1887.

Chairman, X. O. Scott, M.D., of Cleveland.

Reported by Edward Jackson, M.D.

Sympathetic Ophthalmia.—Dr. C. M. Hobby (Iowa City) read a paper based on notes of 300 cases of traumatism seen by himself, excluding cases of superficial injury. In thirty-five cases the injury to one eye seemed to have caused loss of the other. In thirty-six cases enucleation was performed during sympathetic irritation or sympathetic ophthalmia. There were in addition sixty-seven preventive enucleations, in five of which trouble followed in the other eye; and among which were twelve done during panophthalmitis. Of cases in which the second eye was lost, the exciter had been the seat of traumatism in twenty-nine, and other disease in six. Trouble was manifested in the second eye within one month of injury or loss of

vision in the exciter, in eleven cases of sympathetic ophthalmia, and eleven of irritation; between one and three months, in four cases of ophthalmia, three of irritation; between three months and a year in two of ophthalmia, one of irritation; over a year, sixteen of ophthalmia, seventeen of irritation. The shortest time was two weeks, the longest forty years; but as to the latter case there is some uncertainty about the diagnosis. Most of the thirty-five cases in which both eyes were lost were seen from one to twenty years after the loss of the second eye. The condition of the sympathising eye was in twenty, posterior synechiæ usually complete; in two, atrophy of the globe; in one, absolute glaucoma; in one, the results of neuro-retinitis were visible; in three, staphyloma of the ciliary region existed; and in the remainer an opaque cornea, usually vascular, forbade inspection. Of five cases of neuro-retinitis, only the one mentioned had lost the power of counting fingers.

Five cases were narrated in which the second eye was lost by inflammation, coming on after the enucleation of the exciting eye; in four of these it was strongly probable that suppurative inflammation of the uveal tract existed in the exciting eye at the time of enucleation. The writer's immediate knowledge included two cases of death after enucleation. In both the operation had been done during panophthalmitis. He believed not only that fatal results following enucleation during flagrant panophthalmitis are more frequent than our literature would indicate, but that prophylactic enucleation under such circumstances should be avoided, for the additional reason that during the activity of the panophthalmitic process enucleation does not possess the prophylactic influence which we all recognise as the paramount reason for removal of an eye. In two cases the exciting had ultimately retained better vision than the sympathising eye In the early stages of sympathetic serous and plastic iritis enucleation had been done with good results. In three cases the sympathetic inflammation was confined to the iris, or iris and cornea; and in all of them fair vision was obtained by iridectomy.

Dr. G. E. Frothingham (Ann Arbor) thought the reader's experience exceptional as to the danger of enucleation in panophthalmitis, and the liability to subsequent sympathetic disease

He had never seen such bad results follow enucleation, and thought too much importance was attached to von Graefe's dictum on this subject.

Dr. T. E. Murrell (Little Rock) had never seen bad results from enucleation. He did it in the presence of panophthalmitis. In all cases where he had enucleated after sympathetic inflammation had shown itself, the second eye had been lost.

Dr. M. F. Coomes (Louisville) had seen, in a little girl, meningitis coming on thirty days after enucleation, terminating in recovery with impaired vision.

Dr. E. Jackson (Philadelphia). The danger of enucleation during panophthalmitis cannot be fixed until we know how often meningitis ensues where enucleation is not done. This does sometimes occur.

Congenital and Spontaneous Displacements of the Crystalline Lens.—Dr. J. L. Thompson (Indianapolis) reported twelve cases. Two cases of the congenital variety occurred in brothers, and a third in their cousin. There was no intermarriage, or evidence of other taint. The points illustrated and emphasised were that heredity plays an important part in congenital displacements. Such luxations are liable to be progressive and to lead to cataract and to glaucoma. Most of the eyes are highly myopic, the myopia being due to the displacement of the lens rather than to antero-posterior elongation of the globe. Spontaneous luxation of the lens is, in a large proportion of cases, due to chronic congestion and subacute inflammation of the uveal tract, and it often (?) causes the acquired myopia of elderly persons. Partial spontaneous luxation occasionally results in the spontaneous cure of cataract, not only by falling of the lens below the margin of the pupil, but also by degenerative metamorphosis and subsequent liquefaction.

Dr. L. Connor (Detroit) had seen one case of absorption of senile cataract after dislocation.

Dr. D. S. Reynolds (Louisville) asked if the cases of congenital displacement presented other anomalies of development. He had seen a boy, aged 14, with aphakia in one eye, and in the other a small lens that could be shifted back and forth, through the pupil, by change of position.

Dr. Thompson.—Some of the cases at least presented no other anomaly.

Hypopyon-keratitis Treated by Frequent Irrigations with Corrosive Sublimate.—Dr. F. C. Hotz (Chicago) regarded this affection as due to infectious germs, and to be met by the prompt destruction of the germs. The cautery only reaches the germs in the tissue destroyed, and is apt to destroy some sound tissue; and it can only be applied by an expert. He had adopted the treatment of washing thoroughly the lids, conjunctiva, and cornea with a solution of mercuric chloride, 1 to 5000. The eye was then covered with a compress, moistened with the same solution, and both eyes bandaged. Every hour the eye was opened and the solution instilled; the head being thrown well back, the upper lid held away from the eye-ball, and the cornea well inundated; the eye was kept in this position a minute, then closed, and bandaged as before. Improvement occurred in from twelve to twenty-four hours. The frequency of the instillations was then decreased. After the hypopyon had disappeared, they were reduced to three a day, which were continued until the healing of the ulcer was complete. Twelve cases had been treated in this way, in none of which did perforation occur after the treatment was commenced.

Dr. W. T. Montgomery (Chicago) had employed this mode of treatment about six months with excellent results. In the case of a healthy young man with ring ulcer, the included tissue was apparently just on the point of sloughing when this treatment was begun, yet he escaped perforation of the cornea, which subsequently cleared up nicely.

Dr. L. Connor had been unable to get better results from the use of solutions of corrosive sublimate than he had obtained with ointments of the yellow oxide of mercury, or dusting the cornea with calomel.

Dr. H. B. Young (Burlington, Ia.) had seen great benefit from applications of carbolic acid in this affection.

Dr. Hotz thought that negative results proved nothing unless it were certain that the treatment had been faithfully carried out just as described. Home treatment of the eye is often very inefficient.

Pemphigus, Essential Shrinking of the Conjunctiva in Both Eyes.—Dr. Robert Tilley (Chicago) showed a boy, 12 years old, in whom the lids were universally adherent to both eye balls, the lids being widely opened. In each eye the cornea

was opaque and the conjunctiva dry, hazy, and thickened. The adhesions between the eye-balls and lids were quite loose. Repeated operations, for the purpose of freeing the lids, had failed to give any benefit. The present condition was much the same as when he was first seen. The history was that six years ago this trouble had followed vaccination. Bullæ had appeared on various parts of the body. The eyes had been lost within two months. The bullæ had continued to appear in successive crops for four years. The permanent teeth, erupted during this period, were very defective. There was no evidence of hereditary disease.

After Treatment of Cataract Extractions, and Iridectomies without the Eye-bandage.—Dr. J. J. Chisolm (Baltimore) had discarded the bandage in the treatment of these cases immediately after the last annual meeting. Subsequently he had kept the patients in ordinarily light rooms; and still later had ceased to close the sound eye. The last step he believed new in the treatment of these cases. The percentage of good results had been better than under former modes of treatment. He succeeded in getting most of his patients to submit to operation, and subsequent treatment in the hospital. If the patient was ordinarily healthy, he was not submitted to any preparatory treatment, but was operated on immediately on his admission. Operations were done in the operating room, where the patient was most completely under control, and the operator had every convenience, and could do his work with the greatest ease—such being the conditions best favouring the satisfactory performance of an operation. Cocaine was invariably used as the anæsthetic, and he had never seen any harm from its use. The conjunctiva was washed out with a solution of mercury biniodide, 1 to 25000. The extraction operation was a modified linear with a small iridectomy. In five cases no iridectomy was made, but they were not satisfactory, and none of them retained a perfect pupil, so he had returned to the iridectomy. If the capsule seemed cloudy he extracted it also. After the operation the eye is again washed with the mercuric solution, and closed with a single narrow strip of isinglass plaster across the middle of the palpebral fissure. For this purpose the silk plaster is preferable to gold-beater's skin, on account of the premature giving way of the latter. The patient is then allowed

to open the other eye, walk to his room, and go to bed or not as he pleases. He is not allowed to read, and is restricted to his room, but only for a few days, and may see friends. For sharp pain during the first day a drop of a one per cent. solution of atropia is instilled at the canthus. Anodynes are very rarely required. On the fifth day the dressing is removed, and usually not renewed; but, in some cases, it is re-applied and kept on two or three days longer. Shades are not used, and dark glasses only after two weeks, when the patient is allowed go in the direct sunlight. The practice of leaving the sound eye open had been continued four months without a bad result.

The method, though apparently revolutionary, had reason with it. He believed that the lids, closed thus with plaster, gave the best support possible to the edges of the wound, a support more uniform and better adjusted than was permitted by the bandage. While it was customary to use general anæsthetics, the danger from retching and straining perhaps made the bandage necessary, but with cocaine this was no longer the case. By this method of treatment, of sixty-seven cases of iridectomy, none had been lost; of ninety-eight cataract extractions, six had been lost—one by subsequent iritis; another, aged 92, by iritis during treatment; the third, aged 39, was diabetic; a fourth lost the eye by suppurative hyalitis; the fifth by panophthalmitis; and the sixth by iritis with closure of the pupil.

After Treatment of Cataract Extraction.—Dr. W. J. Montgomery (Chicago) reported twenty cases Graefe's extraction was performed. In two cases of fluid vitreous the lens was removed with the wire scoop; choroiditis and subsequent hæmorrhage into vitreous; vision not improved. One case had iritis, but got good vision; others did well. After the operation he bandages the eye with gauze, or mosquito netting, leaving the other eye free. On the first half-dozen he had tried closing the lids with isinglass plaster, but found it liable to be loosened by the perspiration, and uncomfortable when dry, so he returned to the use of the gauze roller, filling the hollows of the orbit with absorbent cotton. The dressing was changed the third day, and in all but three cases the bandage was omitted the fifth day. He believed this method of after-treatment entirely safe.

Dr. Murrell, since the meeting last year, had not used a bandage after cataract extraction or iridectomy, and had had better results, with greater freedom from iritis and other unpleasant symptoms, than ever before. To close the lids he used a strip of isinglass plaster, one-half inch long and one-third inch wide. One patient after cataract extraction travelled 100 miles on the fifth day; another went home, an equal distance, sixteen hours after an iridectomy.

Dr. Hotz.—Some eyes will heal in spite of anything. A first principle in surgery is to favour healing by securing rest to the part. Rest of the eyes need not mean rest of the whole body; patients may be allowed to sit up. Darkness has been quite generally abandoned in the treatment of these cases. He believed closure of the sound eye necessary to avoid associated movements; and thought closing the eyes with the bandage of mosquito netting, which he used, would cause no more photophobia than closing them with plaster.

Dr. E. L. Holmes (Chicago) had seen two patients loose their eyes from rubbing them with the knuckles on the sixth and seventh days after cataract extraction.

Dr. E. Jackson.—More than twenty years ago Dr. R. J. Levis, of Philadelphia, had discarded the eye bandage after cataract extraction. He closed both eyes by placing upon the upper lids semicircular or crescentic pieces of adhesive plaster. One was applied to the lid, and a second on top of it, and if necessary, a third over that. In this way a sort of splint was formed, which kept the eye closed, by preventing the retraction of the upper lid. The palpebral fissure was thus left entirely free. Dr. Levis had continued to use this plan of treatment with satisfaction up to the present time, but it had never been generally adopted by his colleagues.

Dr. Reynolds.—The most important use of the bandage has not been alluded to—it prevents sepsis by excluding germs.

Dr. J. E. Minney (Topeka) had a case in which the plaster came loose on the second day and was not renewed; it did well.

Causative Relations of Ametropia to Ocular Disease.—Dr. J. E. Harper (Chicago) narrated cases of "granular conjunctivitis" in which there was no permanent improvement under treatment until after the correction of existing ametropia.

Sarcoma of the Optic Nerve.—Dr. G. E. Frothingham (Ann Arbor) reported two cases :—

A boy, aged 7, came with the history that a month before the right eye had become swollen and blind ; it was free from pain ; tension normal ; disc swollen, and its outlines indistinct. Left eye normal. The eye and tumour were excised ; the latter involved the nerve from just back of the globe to the foramen. The tumour was a round-celled sarcoma. The boy remained well after three years.

A girl, aged 19, was first seen with $V = \frac{20}{XX}$; fundus normal ; movements of the globe not impaired ; slight protrusion of the globe directly forward. Later, sight failed, and the exophthalmos increased rapidly. Excision. The tumour extended from one-half inch back of the globe as far into the foramen as it was possible to sever the nerve ; erysipelas set in, and some of the orbital tissue sloughed ; but she recovered, and had remained well in the year that had since elapsed. This also proved to be a round-celled sarcoma.

Epilepsy apparently cured by Correcting Hyperopia.—Dr. Frothingham reported the case of a woman aged 24, subject to epileptic seizures since 11 years old. These were preceded by flickering and dazzling colours before the eyes. There was frothing at the mouth and the tongue was bitten. Bromides caused a temporary improvement. There was anæmia and irregular menstruation. Manifest hyperopia 0·50 or 0·75 D. in each eye, total H = 2· D. Wearing constantly convex 1·50 D. lenses seems to have entirely checked the seizures. Similar results from the relief of eye-strain were reported by other members.

Phlyctenular Ophthalmia.—Dr. D. S. Reynolds (Louisville) believed that under this name were confounded various distinct affections of local and general origin.

Dr. J. H. Thompson (Kansas City) regards it as the local expression of an irritation, either direct or reflex, in a scrofulous patient, or that it depends upon the presence of some irritant in the cornea. Active local treatment is usually not indicated.

Function of the Oblique Muscles in Certain Cases of Astigmatism.—Dr. G. C. Savage (Nashville) had noticed that astigmatism caused least inconvenience when the principal meridians were, for both eyes, horizontal and vertical ; more

when they were symmetrical, as in both inclined upward and outward ; and most inconvenience when they were homonomous as in both eyes passing upward and to the right. He had also noticed efforts, on the part of eyes in which the principal meridians were primarily oblique, to rotate about the antero-posterior axis, so as to make those meridians horizontal and vertical. This would be a cause of eye-strain through the oblique muscles. When the meridians were symmetrically oblique, that of one eye would first be brought to the vertical, and this eye used for a time ; then the meridian of the other would be brought to the vertical, and that eye used ; both eyes being always rotated in the same direction. In this way the strain would alternate ; falling first on one set of muscles, then on the other. When, however, both meridians inclined the same way, the rotation would always have to be one way ; and the strain would all fall upon one set of muscles. The practical application of this was in the accurate determination of the proper direction of the meridians, and in the accurate adjustment of the correcting cylindrical lenses. The eye was less likely to rotate when completely under a mydriatic.

Dr. J. H. Thompson thought the difficulties in the way of such an hypothesis were very great, and that it was hardly warranted by the known premises.

Evulsion for the Radical Cure of Pterygium.—Dr. J. W. Wright (Columbus) had accidentally torn a pterygium from the cornea by a sudden movement of the patient. The case had done remarkably well, and for eighteen months he had practised such a means of removal with unusually good results.

Dr. F. C. Hotz regarded the conjunctiva as dragged on to the cornea by a cicatrization. There is usually a hard cicatricial mass over or in front of the insertion of the internal rectus. This he carefully divided with all tense bands. and removed only the head of the pterygium. He thought tearing in no way superior to cutting, and less manageable.

Dr. J. J. Chisolm found that tearing left a cleaner corneal surface than cutting. To bring together the edges of the conjunctival wound he used an animal ligature, the long hairs from the tail of the opposum, prepared by soaking in a carbolised solution.

The Effects of Placing a Lens Oblique to the Visual Axis.—Dr. E. Jackson (Philadelphia) asked attention to the fact that upon pencils of rays falling obliquely a cylindrical lens acted as a stronger cylindrical lens, and a spherical as a sphero-cylindrical. The extent of this was shown in a table, the first column showing the obliquity of the pencil in degrees, the second the refractive effect of a 1 Dioptry cylindrical lens, and the third column of a 1 D. spherical lens at that inclination.

DEGREE.		1· D. CY.		1· D. SPH.
0	...	1· cy.	...	1· spherical.
5	...	1·01 cy.	...	1· s. = 0·01 cy.
10	...	1·04 ,,	...	1·01 s. = 0·03 cy.
15	...	1·10 ,,	...	1·02 s. = 0·08 ,,
20	...	1·17 ,,	...	1·04 s. = 0·13 ,,
25	...	1·30 ,,	...	1·06 s. = 0·24 ,,
30	...	1·45 ,,	...	1·09 s. = 0·35 ,,
35	...	1·67 ,,	...	1·12 s. = 0·55 ,,
40	...	1·99 ,,	...	1·16 s. = 0·83 ,,

The practical applications of these facts are in the mounting of spectacle lenses, so that their plane shall be perpendicular to the visual axis when in use; the necessary limitation of the field of accurate vision through strong lenses, and the importance of accurately and fully correcting myopia, so that the patient shall not run the risks of an astigmatic pencil of rays to secure a fuller correction by turning the head and looking obliquely through his glasses.

Supposed Carotid Aneurism.—Dr. C. Williams (St. Paul) reported a case of exophthalmos, pulsating tumour of the orbit, and bruit. History was that symptoms had appeared suddenly, after violent vomiting and retching, in a strong man of 27, a hard drinker. The pulsation and bruit were checked by compression of the carotid. The common carotid was tied. On the tenth day secondary hemorrhage occurred death three days later. Autopsy; no lesion of the artery extensive softening of the left anterior hemisphere.

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OPERATION FOR THE ADVANCEMENT OF THE RECTUS WITH THE CAPSULE.

By A. E. Prince. Jacksonville, Illinois.

An account of my operation for advancing the rectus, together with the capsule, appeared originally in the "St. Louis Medical and Surgical Journal," June, 1881, and an account of the *pulley modification* in the "New York Medical Record" of August 8th, 1885.

In devising this operation the three points aimed at have been :—(1.) To secure an unyielding anterior fixation point by utilising the dense episcleral tissue. (2.) To avoid the danger of splitting the theca and consequent escape of the muscle, by the formation of a loop suture perforating the capsule and conjunctiva, the cutting tendency of which should be transverse to the direction of the muscular fibres; and (3.) The formation of a knot, which, while avoiding the danger of vertical displacement, would secure precision in the maximum as well as the minimum degrees of deviation and insufficency, and at the same time be subject to modification after the recovery from chloroform or the paresis which attends manipulation.

Operation.

Preliminary tenotomy.—In high degrees of deviation, tenotomy of the opposite rectus is made for the double purpose of increasing the effect, as well as that of equalising, on the two sides, the cicatrisation, thus preventing consequent deviation.

Pulley suture.—Fig. 1, *a*. The eye being fixed, the anchor or pulley suture *a*, is introduced slightly into the dense tissue, one millimetre from the corneal margin, with a very sharp slender curved eye-needle.

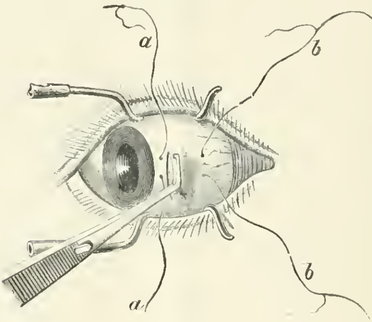

FIG. 1.

Separation of the tendon.—The conjunctiva and capsule of Tenon having been divided, one branch of the advancement forceps (Fig. 3) is introduced underneath the tendon of the rectus, and the other closed upon it, securing the edge of the retracted conjunctiva, after which the tendon is separated from the sclera.

Loop suture.—Fig. 1, *b*. Each end of a thread being armed with a needle, both are passed from beneath the elevated rectus, through the capsule, muscle, and conjunctiva, enclosing the middle portion of the rectus in a loop, from which it cannot escape. The tissues in the grasp of the forceps are now divided two millimetres anterior to the loop suture, the location of which will depend on the amount of advancement required in each individual case.

In the absence of an efficient advancement forceps, this suture may be introduced by opening the conjunctiva and capsule parallel with the margin of the rectus, elevating the muscle on a strabismus hook, and suturing it together with the capsule and conjunctiva before separating the tendon.

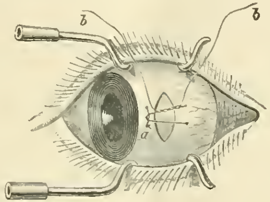

FIG. 2.

Advancement.—Fig. 2. One end of suture *b* is crossed over suture *a*, both ends of which are now brought together and securely tied, enclosing the former in a loop or *pulley*. Both ends of *b* are now brought together in the form of a surgical knot, and it becomes apparent that in proportion as they are tightened over the pulley formed by *a* will the cut end of the rectus be advanced, simultaneously closing the conjunctival gap.

To obtain the most perfect correction, a bow-knot is applied and time allowed for recovering from the effect of traction, which should, as much as possible, be avoided during the operation. After this, the knot may be secured, or the effect increased or diminished as conditions may indicate.

Very nearly, if not quite, the same effect may be obtained by reversing the order of the sutures and making the scleral attachment with the needle at one end of suture *b*, in which case the pulley will be formed by the bridge of dense scleral tissue. This

suggestion has been made by several, and has been employed in the operations at St. George's Hospital, London.

Limiting tenotomy.—The conception of a sliding suture, enabling the operator to regulate the effect to any desired degree, removes much of the uncertainty attending tenotomies in cases of insufficiency and diplopia. There being no cause for ex-section, a curved needle is passed into and out of the tendon, subsequently dipping into the sclerotic in the reverse direction, thus forming sutures *b* and *a* with one continuous thread. The tendon is then completely divided without anxiety from over-correction, for, should it occur, the surgeon has but to limit the effect by tightening the suture when the tendon is advanced as may be required. In the accurate correction of strabismus, the surgeon will do well to abandon the use of the linear strabismometer, and resort to the angular method of measuring these deviations, which can in no wise be accurately determined or expressed except in arcs of circles.*

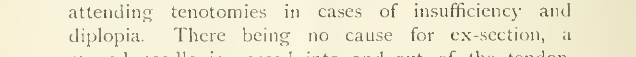

FIG. 3.

The remaining difficulty which has been experienced in these operations is the recovery of a muscle retracted from a previous operation. To accomplish this a curved needle (Fig. 3) has been devised, which will be found useful in various operations on the conjunctiva. It has a short curve with an eye in the point, through which the thread passes after leaving

* "Manual of Examination of the Eyes," Landolt, p. 49, ed. 1879. "Traité d'Ophthalmologie," Landolt, and Wecker, Vol. 1, p. 915.

a spool in the handle, on which it is wound after being sterilised. Its size and shape enable one to introduce the point through tissues back of the equator of the globe. Any merit of construction which it may be found to possess is to be attributed to Geo. Tiemann and Co., New York. This, as well as the forceps (Fig. 3), may be had of Weiss, London.

E. Jackson (Philadelphia). Observations on the action of Stenocarpine, the new Local Anæsthetic and Mydriatic. *Medical News (Philadelphia), September 3rd, 1887.*

Since the discovery of cocaine many observers have been on the look out for efficient substitutes for that invaluable drug, but hitherto without success. The present paper tells of the discovery of an alkaloid, said to be obtained from the leaves of a tree common in Louisiana, which equals and perhaps surpasses cocaine, so the author says, in its power to abolish the sense of pain in the part to which it is applied. It has been named stenocarpine on the ground that the leaves from which it was obtained are those of the tree *acacia stenocarpo*, but Jackson thinks this source unlikely, and the name therefore unsuitable.

The story of the discovery is, that Mr. M. Goodman, V.S., having applied to the fetlock of a horse a poultice made, by chance, of these leaves; subsequently made a free incision into the part without eliciting any evidence of pain. He furnished some of the leaves to Dr. Allen M. Seward, who obtained therefrom an alkaloid, a two per cent. solution of which caused local anæsthesia in the eye of a cat. Some of this solution was placed in the hands of Dr. J. Herbert Claiborne, who found that it produced anæsthesia in the eye of the rabbit and of man; also of the mucous membrane of the nose, and of the skin. That it produced wide dilatation of the pupil, and in some cases a diminution of intraocular tension, and slight dulling of the sensibility of the tympanic membrane. Dr. Claiborne published an account of the drug, and the results obtained from its application, in the "Medical Record" of July 30th, 1887.

After this Dr. H. Knapp experimented with it, applying the same solution to the mucous membranes of the eye, nose, throat, urethra, and rectum, producing anæsthesia in all of them.

Dr. Jackson obtained some of this two per cent. solution of the drug. It was clear, of a faint brown tint, and had a taste distinctly bitter, but nothing like the intense bitter of quinine or strychnine. A few seconds after its application to the tongue and lips there was a peculiar sensation of numbness precisely similar to that produced by cocaine, but more intense than that caused by the four per cent. solution of the latter drug. One drop, a half minim. of the solution, placed in the conjunctival sac, caused smarting more noticeable than any similar application of a four per cent. solution of cocaine, but still not severe, and passing off in a few seconds. Succeeding this there was the feeling of "stiffness," "dryness," or "coldness" of the lids, which cocaine produces, and immediately a notable widening of the palpebral fissure, as compared with that of the other eye. After a carefully observed and recorded experiment upon himself, Jackson tested the action of the drug in sixteen other persons. No application made to the human subject produced constitutional symptoms; but not more than four minims of the solution was used in any one case.

In all cases it caused an anæsthesia, complete within one, two, or three minutes, and passing off mostly within a half hour. In all, the palpebral fissure was notably widened, the pupils widely dilated and fixed; and the power of accommodation very nearly, or quite, abolished by a single instillation. When the instillation was repeated the accommodation was always entirely abolished. When no other mydriatic was used, recovery of the accommodation and pupil was almost complete at the end of three days. Dr. Claiborne speaks of recovery, in the trial made by him, as complete on the third day.

In three cases the drug was used to paralyse the accommodation, for the purpose of determining the refraction. In all it answered the purpose satisfactorily; and in one the subsequent use of duboisine revealed no additional hyperopia.

In no case could a distinct change in the tension of the eye be detected, though a slight reduction possibly occurred in

some. Corneal changes such as are sometimes noticed after an equally free use of a four per cent. cocaine solution were not observed.

The author thinks the new drug likely to prove very valuable, inasmuch as it seems to be a local anæsthetic more powerful than cocaine, and a mydriatic at once powerful and brief in its action, like homatropine.

EISENLOHR (Hamburg). A Case of Ophthalmoplegia Externa Progressiva and Ultimate Bulbar Paralysis with Negative Autopsy. *Neurol. Centralbl.*, 1887, *No.* 15, 16.

It is proverbially difficult to prove a negative, and we may in general safely neglect negative results unassociated with positive. Such cases as the above, however, are worthy of record and study if only to prevent us from being too dogmatic in regard to cerebral physiology and pathology, and thereby barring our future progress.

The patient, a girl 18 years of age, showed no evidence of syphilis, either hereditary or acquired, and the family history was also negative in this direction. From her childhood she had suffered from typical attacks of migraine, at first every few months, latterly every few weeks, first one side, then the other, accompanied by vomiting and lasting twenty-four hours. Whether the several attacks of paralysis of the ocular muscles actually coincided with attacks of migraine could not be ascertained, but her mother stated that this was the case with the first appearance of ptosis. Two years before, the patient was suddenly attacked with diplopia, the cause for which was said by the doctor to lie in the right eye. Under the use of potass. iodid. this disappeared in about three weeks, but returned at intervals during the following year. During the summer of the following year there appeared partial ptosis on the left side, which also improved under potass. iodid., but appeared on the right side, and then changed frequently from side to side. For half a year diplopia had disappeared, but in July, 1886, a year after the ptosis appeared, while suffering from a severe attack of migraine, the patient was suddenly seized with weakness of both hands.

In the beginning of August, 1886, new symptoms appeared, slight weakness of the legs, dyspnœa on exertion, and dysphagia to such an extent that the swallowing of solid food became almost impossible. At the same time there was difficulty of speech, especially towards evening, and weakness of the muscles of mastication and the neck muscles. There was no pain or disturbance of sensation, and the vegetative functions were normal.

On August 16th Eisenlohr saw the patient, a delicate cachectic-looking girl. He found bilateral incomplete ptosis, somewhat more marked on the left side. Pupils and accommodation normal. Both globes almost motionless, the left slightly diverging. No diplopia. Closure of the lids complete, but with little energy.* Paresis of both facial nerves, especially in voluntary movements. Tongue protruded straight, showing slight vibrations on the right side. Palate movements very slight, and pharyngeal reflexes much diminished. Swallowing, even of liquids, difficult; and nasal regurgitation frequent. Collection of saliva and mucus in mouth, especially after food. Movements of the head and respiratory movements wanting in energy, and the same also as to the limb movements. Knee-jerks present. Sensation and electrical reactions unaffected.

The diagnosis was made of a chronic degeneration of nerve cells in the neighbourhood of the oculo-motor nuclei, extending to the deeper motor nuclei of the bulb and the anterior grey horns of the cord. Rest in bed, sodium iodide and mercurial inunction were prescribed, and two days later galvanism applied to the neck, the anode on the nape, the kathode laterally and anteriorly. Swallowing improved slightly, but the pulse continued rapid and feeble. Respiration superficial, and ultimately failing somewhat suddenly five days after Eisenlohr saw her.

The autopsy was made twenty-four hours after death, and the medulla oblongata, the pons, and the region of the oculo-motor nuclei carefully examined, both naked eye and microscopically. The result may be summed up as entirely negative. The roots of the oculo-motor and bulbar nerves showed no degeneration. The cerebral cortex and the peripheral portions of the above nerves and their muscles were not examined. The

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* No note as to vision or condition of fundi, presumably normal.

suggestion of peripheral neuritis can, however, scarcely be made. Eisenlohr holds, in view of the chronic development of the ocular symptoms, the frequent changes and remissions, and also the intact condition of the roots of the oculo-motor nerves.

As parallel with his case, Eisenlohr quotes that recorded recently, by Oppenheim, of chronic progressive bulbar paralysis in a woman of 29 years of age also with negative autopsy; and also Bristowe's well-known case. He emphasises the frequent attacks of migraine, and suggests, although with diffidence, that what in ordinary cases would have resulted only in a temporary so-called functional paralysis may in this case have become permanent, owing to an under development of the fibres of the bulbar nerves, which the microscopic examination seemed to show. The rapid fatal termination is rare in such cases, and taken together the facts of the case simply show the necessity for caution in confidently predicting a nuclear degeneration in cases of ophthalmoplegia externa.

S. M. Burnett (Washington). A Theoretical and Practical Treatise on Astigmatism. *St. Louis: J. H. Chambers and Co.*, 1887.

This is a handsome volume of 245 pages, illustrated with fifty-nine good wood cuts. It gives an admirable account, at once clear and scientific, of the whole subject of astigmatism: its optical definition and nature, the history of its discovery, its symptoms and diagnosis, the many different methods which have been devised for its clinical examination, the optical treatment which it demands, and some interesting statistics. At the end of each chapter is a good bibliography.

It is a remarkable sign of the advance of ophthalmic science that an ocular defect, the very existence of which was hardly known to the medical profession thirty years ago, can now alone form the subject of a good-sized text book. It is by no means necessary, however, for the student or even the special practitioner, to master all the methods and apparatus which are here offered to him. It is likely, we think, that during the next thirty years very many of the instruments devised for the estimation of astigmatism will permanently

retire to our museums, and that in the consulting room certain simple modes of testing, requiring little apparatus and little expenditure of time, will gradually supplant all others; as to which these methods shall be, however, there is no sign as yet of a speedy agreement.

To specialist readers the chief interest of the volume lies, of course, in the statements which it contains concerning the author's own experience and practice. These may to some extent be gathered from the following brief extracts:—

"The various anomalies of refraction form about one-third of the whole number of eye cases presenting themselves for treatment in private practice, and of these two-thirds, or about twenty per cent. of the whole, suffer from astigmatism in an appreciable degree." In an appendix, 475 cases of astigmatism, taken seriatim from the author's private case book for a period of five years, are tabulated. These afforded 806 astigmatic eyes, *i.e.*, the astigmatism was unilateral in forty-one per cent. of the cases. Correction brought the visual acuteness up to $\frac{4}{4}$ in about thirty-six per cent.,—a somewhat higher proportion than has been recorded by some others, the difference being due, the author thinks, to his frequent correction of low degrees. In the higher degrees normal acuteness was rarely found. In 504 of the 806 eyes the principle meridians were vertical and horizontal. The relative frequency of the various forms was as follows:—

Simple myopic astigmatism . .	37	per cent.
Compound myopic astigmatism .	20	,,
Simple hyperopic astigmatism . .	26	,,
Compound hyperopic astigmatism .	14	,,
Mixed astigmatism	3	,,
	100	

Speaking of spasm of the ciliary muscle and the use of atropine in testing for glasses, the author quotes observations of Mauthner, Hirschberg, and Landolt, to show how seldom it is really necessary to paralyse the ciliary muscle, and continues —"In America, however, it has become a custom with quite a number to resort to atropinisation as a routine practice in all cases. It should be the aim of the ophthalmic practitioner to attain such skill in the determination of refraction that he shall

have accuracy in his results at a minimum of inconvenience to his patients. The best method, it seems to me, is to obtain the best results possible by the methods already described . . . . and give the glasses thus indicated for trial. If these should not prove satisfactory we still have atropinisation left. . . . . My own guide to the use of atropine I find in the direct method of examination by the ophthalmoscope. If I find the patient to persistently refuse + glasses, and yet there is a hypermetropia manifest under the ophthalmoscope, or if, while looking at the fundus through + glasses, I see the vessels becoming alternately clear and indistinct, indicating an alternate relaxation and contraction of the ciliary muscle, I know that there is an excessive tonicity of the ciliary muscles which masks a hypermetropia, and then I usually use atropine in order to discover to what extent the tonicity reaches; not necessarily for its full neutralisation, but as a guide in the selection of glasses that can probably be worn with comfort and advantage. . . . . What we wish to obtain is the static refraction of the eye in its two principle meridians when the organ is in its normal condition, and not when its intrinsic muscles are in a state of spasm or paralysis." We cordially agree with the foregoing, and work precisely on the principles here laid down, excepting that what Dr. Burnett does with a refraction ophthalmoscope we do by means of the shadow test with the plane mirror.

With regard to the shadow-test (which our author terms also *skiascopy*, properly reserving the term keratoscopy for those methods by which the cornea is inspected), it is interesting to notice that our American colleagues value it much less highly than we do in England. Not long since, Dr. Loring wrote of it—"It still remains, however, in my opinion the most difficult and least satisfactory of any of the methods of determining the refraction of an eye." Dr. Burnett says—"Like most of the other methods of objective examination, it requires much practice to become expert in its use, and is, according to my experience, more consumptive of time than the ordinary ophthalmoscopic methods." We should like to see this question settled practically by a well-arranged contest: Twenty refraction cases, including astigmatism of all varieties, taken haphazard from among hospital out patients of all ages;

umpires to note the time occupied by each competitor in examining and prescribing glasses for the whole series, and to check the results obtained ; the competitors to be experts in the use of the refraction ophthalmoscope, the shadow-test, or any other methods with which they are willing to enter the lists. We should expect the shadow-test to win easily, but we are prejudiced in its favour, and may be entirely mistaken. All probably will agree with Dr. Burnett in saying that "no diagnosis of astigmatism should be considered as fixed until it has been verified by an examination with cylindrical glasses and test-types."

In the chapter on the correction of astigmatism, the author wisely urges that the question is not simply one of optics ; "cylindrical glasses should not always be prescribed simply because distant vision is thereby rendered better." If persons with low degrees of astigmatism "have good distant vision, and do not suffer, no good can result from forcing on them the constant use of glasses." On the other hand "it occasionally happens that the correction of astigmatism as low as 0·25 D is found very beneficial. Such cases are usually found in persons whose nervous systems are below par, and on restoration to health the glasses can be laid aside."

The last chapter in the book deals with irregular astigmatism and conical cornea, and here great value for diagnostic purposes is attached to keratoscopy (properly so-called) by means of Placido's disc, and keratometry by the ophthalmometer of Javal and Schioetz. "The chief obstacle that has hitherto lain in the way of a more general employment of cylinders in such cases is doubtless the great difficulty usually experienced in unravelling the optical complexities inherent in the condition. . . . . The ophthalmoscope offers little or no assistance in the task. It is here that keratometry and keratoscopy find one of the fields for their most satisfactory application. A simple inspection of the corneal reflexion of the concentric rings is sufficient to give us the direction of the principle meridians, and if a keratometer is at hand it is easy to find the difference in the refraction of these two meridians." As our author makes no mention of it, we must here again refer to the value of the shadow-test ; with no other apparatus than the plane mirror and the ordinary trial lenses and frame

one can rapidly detect the presence, direction, and amount of any correctible astigmatism which exists in the pupillary area in these cases.

Among the many excellent original illustrations to be found in the book, the one representing the fundus of an astigmatic eye as seen by the direct method deserves special notice.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

TWENTY-THIRD ANNUAL MEETING,

Held at New London, Conn., July 20th and 21st, 1887.

President—Dr. William F. Norris, of Philadelphia.

Reported by Edward Jackson, M.D.

Cataract Extraction without Iridectomy.—Dr. C. S. Bull (New York) reported thirty-six cases done by Daviel's method. The patients varied in age from 13 to 79 years. Of the cataracts, twenty-four were hard, eleven soft, one traumatic. Antiseptic precautions were strictly observed both as to operation and after treatment. Mercuric chloride was used in solution of 1 to 1,000 for washing the operator's hands and the patient's face, and 1 to 5,000 for repeatedly douching the conjunctiva. The instruments were kept in an alcohol bath. The corneal flap was cut with a narrow Graefe knife, and included one-third the corneal circumference. Usually the iris did not prolapse. The capsule was opened by a cystotome, and the lens extracted by manipulation. If the iris had prolapsed, it was then replaced. Any lens matter remaining in the anterior chamber was then washed out with a solution of mercuric chloride, 1 to 10,000: eserine was instilled; the conjunctiva again douched with the mercuric solutions, and the eye closed with antiseptic linen and absorbent cotton. and bandaged. Mecuric solutions and instillations of eserine were introduced twice daily beneath the bandage, which was removed on the second day. If the eye seemed doing well it was not opened until the fourth day, then the bandage was again replaced and kept on one day longer. The patient was confined to bed until union of the wound was firm enough to prevent secondary prolapse of the iris, which did not occur in

any case. In twenty cases the iris had to be returned to the anterior chamber after the extraction, but in none was there suppuration. A peripheral incarceration of the iris occurred in the last six cases only. Plastic iritis in six cases, irido-choroiditis in two. Eserine was not used after the corneal incision had firmly united, and atropia only in iritis and irido-choroiditis. The average duration of treatment was twenty days. Subsequent needling was required in two; excision of a piece of capsule in one. The pupil remained central in twenty; somewhat displaced in sixteen. Vision obtained $\frac{20}{XXX}$ to $\frac{20}{C}$, thirty-three cases; $\frac{20}{CC}$ in two, and light perception in one. This operation preserves the natural appearance of the iris. Central vision is about as good as after ordinary extraction with iridectomy, and peripheral vision is better. There is less liability of incarceration of the capsule in the wound; but the technique of the operation is much more difficult. This operation is contra-indicated by a narrow anterior chamber, rigid iris, or fluid vitreous; and iridectomy must be done if the corneal incision proves too short, or the iris is injured by falling before the knife.

Dr. H. Knapp (New York) had completed sixty-eight peripheric-linear extractions without iridectomy, and in eight cases where this was attempted iridectomy had to be done. In three there occurred mild iritis; severe iritis with closure of the pupil in one; protrusion of the iris in three; incarceration, one: capsulo-iritis, one: and suppuration, one. The others did well. Vision was lost in one, and less than $\frac{10}{CC}$ in two others. The pupillary area is obstructed by wrinkled capsule as frequently as after other kinds of extraction. One case of prolapsed iris, on the fourth day, in an attempt to excise it, was partially reduced; the reduction was completed, and the eye recovered, with perfectly central pupil. In the case of a hard drinker the eye recovered well, with $V. = \frac{20}{L}$; a needle operation was done, and twenty-four hours later he was attacked with dysentery and acute nephritis; circumcorneal redness, chemosis, and increased tension appeared; and by the third day he could only see movements of the hand. An iridectomy cured the eye. On the whole this method seems as safe, and on some accounts preferable to the ordinary cataract extraction with iridectomy.

One Thousand Cataract Extractions.—Dr. H. Knapp had previously reported these in series of one or two hundred. The results in the different series were given in percentages as follows :—

Hundreds.	Good.	Moderate.	Failures due to Suppuration.	Other causes.
First	70	22	3	5
Second	86	12	2	0
Third	86	9	3	2
Fourth and fifth	81	7½	8½	3
Sixth	89	1	8	2
Seventh	88	7	2	3
Eighth	90	8	1	1
Ninth and tenth	90½	5½	3	1

In the first series the section was made far back, and loss of vitreous was frequent. In the second the technique was considerably improved. In the fourth and fifth Graefe's section was practised. and a piece of capsule excised ; and great care was taken to remove all lens substance by manipulations, which he now regarded as bacteriologically bad. After this the section was shifted into the peripheric circular section of Wecker. In the ninth and tenth series the operation was done with antiseptic precautions. In two cases the other eye had been lost by sympathy. Suppuration may commence elsewhere than in the corneal section. Purulent capsulitis frequently occurred in the earlier series. He was convinced that all suppuration was connected with germ life, and paid tribute to the late Prof. Horner for his share in introducing antiseptic methods in ophthalmic surgery.

With regard to iridectomy, there were cases in which it was necessary, and others in which it was best.

Aseptic Cataract Extraction with Irrigation.—Dr. C. H. Williams (Boston) reported five cases. The irrigating fluid was the ½ per cent. solution of sodium chloride recommended by McKeown. Instead of a syringe he used a glass flask with a capacity of 50 cc., having two glass tubes blown into the sides, one drawn to a fine nozzle that could be easily inserted into the anterior chamber, and the other having attached a rubber tube and mouthpiece, giving the operator easy control of the force of the stream. The irrigating instruments and 2 per cent. solution of cocaine were sterilised in a steam steriliser. This

did not impair the anæsthetic powers of the cocaine. Other instruments and dressings were sterilised by dry heat at 105° Cent. To determine the efficiency of a solution of biniodide of mercury used for washing out the conjunctival sac, experiments were made with plate cultures at the Harvard Medical School, through the kindness of Dr. Ernst. Equal parts of biniodide of mercury and iodide of potassium were dissolved in water, and added to a 10 per cent. nutrient gelatine, to give a series of strengths up to 1 to 5,000 of the biniodide to the gelatine. Ten days after exposure no growth of bacteria was found on any of these plates, although they developed abundantly on unprotected plates exposed at the same time. Gelatine of the strength of Panas' solution, 1 to 20,000, showed after four days 1·5 and 0·8 colonies to the square centimetre of surface in two series, while on unprotected plates exposed at the same time the average was 10·7. All the extractions were done without iridectomy. In two a suture was passed through the small flap of conjunctiva left at the apex of the corneal flap to unite it to the conjunctiva above. This was found to hold the wound well in place. A layer of iodoform was dusted along the edge of the closed lids just before applying the bandage.

Dr. E. Gruening (New York), since last year, had done sixteen cataract extractions without iridectomy. In eleven cases a perfect pupil was obtained. In the others either iris had to be removed subsequently or synechiæ were formed. He did not use direct irrigation of the anterior chamber, but washed out the conjunctival sac with a saturated solution of boric acid, which seemed to be sucked up into the anterior chamber in sufficient quantity to cleanse it of lens matter. In the same time he had made thirteen extractions with iridectomy.

Does Sunstroke Affect the Sight Permanently?—Dr. J. A. Spalding (Portland, Me.) introduced the question because pension claimants are now coming forward asserting that they suffered from sunstroke and permanent loss of sight in the army (1861-65), and finally became more or less blind. In the vast extent of ophthalmic literature there has been reported but a single undeniable case in which sunstroke was followed by permanent blindness. In six cases soon after the sunstroke

there was distinctly marked optic neuritis, and in some vision was reduced to a low degree. Yet ultimately all six recovered perfect vision without much, if any, treatment. Cases illustrative of the assertions of pension claimants were presented. The frequent allegations of patients "losing their sight during a sunstroke," or of a dimness coming over their eyes, are simply descriptive of the incipient stage of unconsciousness. These recollections become in later years the basis of the pension claimants' assertions, that their vision was seriously affected by sunstroke.

Dr. E. Jackson (Philadelphia) found that in the cases of those now claiming pensions for defective vision, the diagnosis must be made as in the case of the hysterical and malingerers. He had seen one case of permanent impairment of vision after sunstroke, but in it there was post-neuritic atrophy, and a clear history of meningitis.

Quinine Amaurosis.—Dr. D. B. St. John Roosa (New York) reported the case of a lady who had intermittent fever for some weeks last summer. In October, when apparently well and not menstruating, she was suddenly siezed with convulsions and became unconscious. Four thirty-grain doses of quinine were given per rectum. By the third day she had recovered consciousness, and vision was reduced to counting fingers at four feet, papillæ white, retinal surface uneven. She took quinine three times a day, and strychnia was given hypodermaticially daily, in increasing doses, until the limit of tolerance was reached at $\frac{1}{24}$ of a grain. After seven weeks her best vision, which was at first eccentric, was again centric, and enabled her to see large objects at a distance, small ones close to her, and to read No. 2 of Jaeger's scale. In May her sight had greatly improved, and later she was seen walking about the city unattended.

Dr. E. Gruening had seen a lady of 50, who, after a single thirty-grain dose of quinine remained deaf for twelve and blind for twenty-four hours. Five days later the appearance of the fundus and the central vision and colour perception were normal. But the fields of vision were greatly limited, extending not over 30° in any direction. This seemed like a case of slight quinine amblyopia, and such cases had rarely been reported.

Dr. G. C. Harlan (Philadelphia) was struck with the resemblance of this case to certain cases of hysterical amblyopia that he had seen.

Dr. Gruening had learned from her family physician that this patient was hysterical.

Dr. Roosa stated that it had not been established to his satisfaction that ischemia is the primary lesion in quinine amaurosis. Experiments upon the drum membrane of the ear indicate the primary lesion to be congestion.

Ring Scotoma.—Dr. S. M. Burnett (Washington) gave the full histories of two cases of this affection which he had noticed through a period of two years. In one there was the history of syphilis, but in both there was choriditis with vitreous opacities. The gross changes of the choroid, which were found in but one case, did not correspond in any particular with the defect in the visual field. In one case the affection was monocular, there being iritis with adhesions in the other eye. In the other case the trouble began as a typical right hemianopsia, with left semi-annular scotoma. The central clear field was oval 10° by 20° in diameter. All writers on this subject (a full bibliography was appended to the paper) have placed the pathological process inside of the eye, though in no case were the choroidal changes of a character to justify such a conclusion; and in none were the changes in the visual fields followed so long or so closely as in these cases, eighteen diagrams of the fields, taken at various times, being exhibited. The course of the nerve-fibres in the tract, chiasma, and nerve, as recently demonstrated, particularly in central scotoma, which in nearly every instance coincided with the clear space in these cases, seems to justify the assumption that the fibres supplying the intermediate parts of the retina were hindered in their function, either by a localised neuritis or pressure from adjoining parts.

Dr. H. D. Noyes habitually searched for this defect, and had sometimes found it in retinitis pigmentosa. He had also seen it in a girl of 17, previously treated for refractive trouble, who came for pain and dimness of sight in one eye. There was no visible lesion, brain trouble, or hysteria. Pressing the globe firmly into the orbit caused pain, which was taken as

evidence of an orbital neuritis. Under treatment complete recovery took place in two weeks. This condition would probably be found more frequently if systematically looked for.

Dr. C. S. Bull had seen ring scotoma in a man aged 36, who had been injured in the right orbit in childhood, and in the left parietial region when 19. Epileptic seizure had occurred since the latter injury. Vision, R.E. counting fingers at two feet, L.E. $\frac{20}{XX}$ at the centre of the field. Vision unchanged within two years.

Dr. H. Knapp had seen one case of neuro-retinitis with ring scotoma. The eye afterward became blind with glaucoma. There were no ophthalmoscopic appearances corresponding to the scotoma.

Dr. W. F. Mittendorf had encountered it in an elderly gentleman with partial atrophy of the nerve. It extended from about 5° to 15°; no corresponding lesion of the fundus. Recently attention has been called to the existence of ring scotoma near the periphery of the field in glaucoma; on search he had found it once in five or six cases. There was no change in the ophthalmoscopic appearances of the corresponding part of the retina.

Dr. O. F. Wadsworth (Boston) reported a case in a man aged 25, who was injured by being run over by a waggon. There was hæmorrhage into the right eye, and central scotoma. In a short time the hæmorrhage cleared up; and the central became a ring scotoma, with central vision $= \frac{14}{X}$. The zone of blindness was about one and a half feet across at the distance of fourteen feet. This condition remained unchanged for, at least, two years.

The so-called Orthopædic Treatment of Paralysis of the Ocular Muscles.—Dr. C. S. Bull (New York) had tried the method proposed by Prof. Michel, which consists in seizing the insertion of the muscle with a pair of forceps, and dragging it alternately in the direction of the muscle and in the opposite direction. This was kept up for two minutes at a time, and the sittings repeated daily. Brief abstracts of twenty-one cases, with the results obtained, were given, most of them being palsies of the external rectus, of syphilitic or rheumatic origin. The duration of the paralysis varied from a few days to years. Complete cure was effected in eight cases, notable improvement in six

others, and in seven the treatment seemed valueless. Most of the recoveries occurred in recent cases, though in some a cure was effected after the complete failure of drugs and electricity to accomplish it. Without cocaine the pain of the operation was severe; and even with cocaine it was not entirely painless. The pinching also caused marked irritation of the conjunctiva, which was, however, local and transient.

Recurrent Paralysis of the Motor-Oculi.—Dr. O. F. Wadsworth (Boston). The patient was one of twin sisters, born of healthy parents, who had, in all, seven healthy children. At three years old (1874) both had scarlet fever, followed by discharges from the ears. In 1877 the other twin had headaches, convulsions, and well marked optic neuritis passing into atrophy. Later, headaches ceased and she continued well. In 1878 the patient had severe headache several hours every week; and in 1879 applied because of an attack of an intermittent character, which had lasted two weeks. It began about noon, continued till three p.m., intermitted until five p.m., when it returned to last four or five hours longer. R.E., normal and emmetropic; L.E., highly myopic amblyopic. In March, 1880, there was an attack of headache and vomiting, with ptosis and divergence of the right eye. There was then acute inflammation of the left ear. The pain was always located in the right supra-orbital region. She continued in good health except these attacks, which occurred three or four times a year. In February, 1887, she was recovering from one of them, the preceding interval of immunity having been seven or eight months. Each attack had been accompanied by a discharge of offensive fluid from the right ear, which lasted some days. By March 4th there was much improvement, but April 24th there remained slight ptosis and impairment of upward and downward motion, pupil slightly dilated, and accommodation weak. A large polypus was found in the right ear, which would account for temporary retention of pus.

Fifteen cases of this affection have been recorded, many of them very imperfectly. The statement is often made, as it was by this patient, that during the intervals the recovery was complete. But in no case did the observer state he had himself witnessed such complete recovery. No case had been permaently relieved; three had died. It was difficult to admit that this

disease was either purely functional or nuclear in its origin. Disease at the base of the brain was a more probable cause; and this view was supported by autopsies.

Dr. D. B. St. J. Roosa had seen a young man who, at about 14, began to have intense attacks of migrane, with ptosis and paralysis of the internal rectus. The attacks were growing worse and worse up to three years ago.

Localised Hyperæmia in Muscular Insufficiency.—Dr. J. A. Lippincott (Pittsburg) had seen three cases where the main complaint was of a congestion of the nasal side of the eyeball. Two of these he narrated. In a man of 24, the congested area was sharply limited, had the form of a pterygium, extended nearly to the edge of the cornea, and involved both deep and superficial vessels, but principally the former. There was frontal headache and fatigue on working and reading. It had lasted six weeks, and astringents had not helped it. The Graefe test showed decided insufficiency of the internal recti muscles. Strychnia and rest of the muscles were directed, and in eight days the congestion was greatly diminished and the insufficiency reduced to one-fourth its former amount. In four days more the equilibrium of the muscles was restored, and the congestion and other symptoms had disappeared.

The second case, a salesman aged 29, came with similar congestion of the inner side of the globe, of three weeks' standing. He had been reading a good deal at night. Here also there was insufficiency of the internal recti. Under similar treatment, and douching the eyes with hot water twice daily, recovery was complete within a month.

Dr. E. Jackson said: It is stated, the disability of the base-ball pitcher's arm, which so often limits the achievements of professional players, is an aggravation of normal fatigue, including a congestion involving not only the muscles but their tendons and insertions as well. Was not the condition just described similar, the visible congestion being part of a congestion of the muscle which caused the insufficiency?

Photomicrographs of Sections of Eyes Enucleated for Glaucoma.—Dr. W. F. Norris (Philadelphia) made a lantern exhibit of slides showing the conditions in three such eyes. The first case had been an acute inflammatory glaucoma, which yielded

to a narrow iridectomy, afterwards found not to include the periphery of the iris; and the eye remained quiet eight years. Then, in a second attack, skilled attendance was not obtained for many days; a broad entirely peripheral iridectomy was done, and subsequently sclerotomy, but the eye never became entirely quiet. Later intraocular inflammation with hypopyon occurred, and the eye was enucleated. The other eye remains serviceable and quiet. The sections showed, in a cystoid cicatrix, the stump of iris left by the original iridectomy; the scars of the second iridectomy and sclerotomy well united; degeneration of the head of the optic nerve, probably a step toward excavation; and marked proliferation of the neuroglia of the ciliary nerves where they pass through the sclera.

The second case was of a woman of 70, under observation for hæmorrhagic retinitis. There were some needles of opacity in each lens, V. = R. $\frac{10}{\text{C}}$ L. $\frac{20}{\text{CXX}}$. New hæmorrhages occurred in the right eye, vision was still further obscured, and the globe became hard. An iridectomy was done, the anterior chamber filling with blood during the operation. On the fourth day, and again on the ninth, there occurred renewed attacks of pain and further impairment of vision, apparently due to intraocular hæmorrhage; by the twenty-fourth day light perception was lost. Three days later an attempt was made to do a neurectomy upon the eye; but there occurred such profuse hæmorrhage into the capsule of Tenon that it became impossible to replace the globe, and it had to be enucleated. The left eye regained vision = $\frac{20}{\text{LXXX}}$, then slowly grew worse until the patient died two years later of apoplexy. The microphotographs showed hæmorrhages into the retina, and also into the sclerotic, near the canal of Schlemm. It was notable in this case that the retinal hæmorrhage was the immediate cause of an attack of glaucoma, and that hæmorrhage into the capsule of Tenon prevented the completion of neurectomy. In the third case a successful cataract extraction had been done ten years before, the patient, with glasses, being able to do labouring work afterward. At the end of eighteen months a needle operation was done on the eye, which from that time refused to become quiet, grew hard and glaucomatous, and was enucleated for sympathetic irritation of its fellow. Each end of the scar of the extraction incision presented a cystoid

cicatrix. The photomicrographs all showed imperfect approximation of the lips of the wound from overriding of the corneal flap. An examination of Becker's plates showed a similar overriding in most of his cases. This seemed to show the need of quiet for eye and patient after iridectomy or cataract extraction, until the corneal union was firm.

Dr. H. D. Noyes said that in the case he had reported last year, perfect approximation was prevented at one end of the incision by swelling of the scleral lip of the wound, which was double the thickness of the corneal lip. Into the space so left the iris had been forced, illustrating the beginning of a cystoid cicatrix.

Dr. H. Knapp: Might not the swelling be secondary to incarceration of the iris?

Dr. Noyes believed he had left the wound clear of iris.

Dr. B. A. Randall: In Dr. Noyes' case the anterior chamber must have been obliterated, and the posterior capsule pushed forward, for the sections showed pigment attached to the posterior capsule.

Sarcoma of the Lid simulating Meibomian Cyst.—Dr. B. A. Randall (Philadelphia). A man of 41 came under his care in 1885, with the history of two operations in the previous three years, for the removal of a cyst. The tumour had the position, size, colour, and apparent fluctuation of a chalazion; but a vague grayness suggested pigmentation, and led to its removal by a V-shaped incision through all the tissues of the lid. Section proved the tumour to be a solid encapsuled sarcoma of large spindle cells. The patient passed out of sight for two years, and then returned with a recurrence very like the original, which had also been treated in the interim as a chalazion. The outer half of the lid had now to be removed, and the tumour was found to be of the same nature as before, and again encapsuled. The meibomian glands each time seemed normal, and the tarsus was entirely uninvolved.

Cilio-retinal Vessels.—Dr. Randall presented sketches of the ophthalmoscopic appearances in some cases of this anomaly, and showed a photomicrograph of such a case from the collection of Prof. Norris. He remarked such cases are far from rare, and the occurrence of such an origin of a principal artery or vein supplying two different quadrants of

the retina had come to notice. In two of these cases the vessels could be distinctly seen to join the network of the choroid. The reported cases examined anatomically had arisen directly from the short ciliary arteries, as shown in the photo-micrograph.

The Hohlschnitt of von Jaeger in Cataract Extraction.—Dr. Randall called attention to this as differing from the modified linear extraction only in the knife with which it is executed. To this knife he asked attention, claiming that with it almost all the usual modifications of the linear extraction can be made; and as no aqueous need be lost until the completion of the incision, the cut can be made more safely and smoothly than is possible with the Graefe knife. As illustrating the perfection of the healing, he demonstrated a photomicrograph of a "hohlschnitt" executed by v. Jaeger himself, which he had cut in Prof. Arlt's laboratory about a year after the operation.

Dr. H. Knapp had used Jaeger's knife, but thought it less manageable because of its greater breadth. With the Graefe knife one can withdraw a little and rectify any error in the first position of the counter-puncture.

Dr. H. D. Noyes agreed with Dr. Knapp as to the superiority of the Graefe knife. He had long practised a manœuvre, which he found Panas also employed; after making the counter-puncture the handle is depressed, so as to first make the part of the section adjacent to the counter-puncture. This quickly carries the cutting edge of the knife to the border of the anterior chamber, where the iris can no longer fall before it. Then the handle is raised again as the section is completed.

Dr. S. Theobald (Baltimore) thought the advantage of the narrow knife was, that with it we can first make the counter-puncture and afterward complete the section; with the broad knife both must be done at once.

Dr. Randall said that if the puncture is in the right place, and the knife held in the proper position, the counter puncture must of necessity be right also. Its location was really determined when the incision was commenced.

Dr. Knapp said a broad knife acts more as a chisel, and tends to push the tissue before it.

Dr. E. Gruening thought that the difficulty about making the counter-puncture, is that the point of entering the knife for it is not seen; and it is when the attempt is made to correct its position that aqueous escapes, and the iris is apt to fall before the knife.

Glioma and Pseudo-glioma.—Dr. H. D. Noyes (New York) reported the case of a girl who lost an eye for glioma when 15 months old, and was living in good health at the age of 16 years. The eye removed had been examined microscopically by Dr. Delafield, and pronounced gliomatous. He had seen another case after eight years. He also showed sections of an eye enucleated for pseudo-glioma, showing an inflammatory mass lying in a detached retina. This seemed to have been caused by injury of the floor of the orbit from a fall, striking on the cheek and lower margin of the orbit.

Dr. S. Theobald (Baltimore) had seen a boy, nine years after an enucleation for glioma, with no recurrence. The diagnosis was microscopic only.

Dr. H. Knapp doubted if cure is ever permanent. Had heard of the death of one case after ten years. Saw another case still well after six years.

Dr. W. H. Carmalt (New Haven) agreed that the sarcomata tend to return and become general, even after complete removal. He recalled a case where a mistaken diagnosis of glioma had been made by several experts. The mistake being shown by the microscope.

Dr. J. S. Prout (Brooklyn) had seen pseudo-glioma fatal. Here was additional reason for enucleating such eyes.

Dr. B. A. Randall had seen a case well seventeen years after enucleation for glioma; but did not know about a microscopic diagnosis. In this patient there was no assymetry of the orbit.

Dr. E. Gruening had seen a girl operated on in 1875, and another in 1879, for true glioma. The optic nerve was not involved in either. Both were still healthy.

Dr. B. E. Fryer (Kansas City), in intraocular tumour with hazy vitreous, had been aided to a diagnosis by use of the electric light.

Dr. Noyes could sometimes diagnosticate glioma without a microscopical examination ; at others he could not. He used light from a strong condensing mirror.

Dr. Knapp had used condensed sunlight.

Dr. W. S. Dennett (New York): The main thing is to have enough light ; the electric light is the most available.

Removal of a Prolapsed Lachrymal Gland.—Dr. H. D. Noyes had done this with no unpleasant after effects. The gland appeared as a tumour growing for nine years, hanging within 6 mm. of the cornea, visible on raising the lid. It was quite elastic, and free from pain. A much smaller mass appeared on raising the lid of the other eye.

Relief of Entropion of the Lower Lid.—Dr. H. D. Noyes had dissected up a narrow flap of skin from the base of the lid, and attached the free end to the conjunctiva lining the lower lid. Four years later the parts were in good position, but the bridge of skin remained. He removed this bridge and the cure was complete.

Dr. John Green (St. Louis) makes an incision near the base of the lid, parallel to its free border ; dissects up the skin of the lid, and attaches it lower on the cheek. He then makes an incision on the conjunctival surface parallel to the lid border, not splitting the lid but back from its margin. This gapes and does not contract again in healing. The results from this were satisfactory and permanent. It was the same operation as he practised on the upper lid.

Dr. E. Gruening used the "Hotz method" on both lids, and found them equally amenable to treatment.

A Pulsating Band within the Eye.—Dr. W. F. Mittendorf (New York) reported the case. A band, believed to be connective tissue rather than a lymph sac, stretched between two of the larger vessels, and pulsated regularly, although no pulsation was visible in the vessels themselves.

Dr. L. Howe called attention to the pulsation tracings that could be obtained from the normal eye by use of the plethysmograph.

Dr. E. Jackson had seen on the disc a tag of connective tissue, attached to a perivascular sheath, pulsating visibly, though no pulsation was to be seen in the vessels.

Increase of Blindness in the United States.—Dr. L. Howe (Buffalo) called attention to the fact that from 1870 to 1880 the population increased 30 per cent. and blindness over 140 per cent. The percentage of increase in each state was shown by a diagram. The statistics also showed that blindness increased from north to south, and decreased from east to west. This was illustrated by coloured maps. As for the causes, contagion was found to exert a most important influence. This was shown by examination of 128 pupils in the Batavia Asylum for the Blind, by the statistics of Magnus, and by the records of over 48,000 cases treated at the Manhattan Eye and Ear Hospital. Immigration is also an important factor in view of the number of cases of contagious diseases of the eye introduced every year into the country, and the laxity or absence of quarantine regulations regarding them.

Dr. H. D. Noyes noted the increase of blindness was especially in regions where a large part of the population would be exposed to mining or mill accidents, and where recourse to skilled attendance for such injuries of the eye would be difficult or impossible. Something should be done for the relief of such cases.

Dr. S. M. Burnett: In connection with locality, the influence of race should be considered. Negroes, who form a large part of the population of the Southern States, are exempt from trachoma, but especially subject to scrofulous disease of the cornea.

Dr. W. F. Mittendorf thought the increase largely due to the crowding of young persons into public institutions in the large cities.

Dr. P. A. Callan (New York) asked if societies should not be organised in all large cities to instruct the public in taking care of the eyes.

Dr M. Standish (Boston), in a dispensary service among the Irish, who are especially subject to trachoma, had found that the acute cases came generally from the recent arrivals in the country, as though contracted during the voyage.

A committee, with Dr. L. Howe as chairman, was appointed to further investigate the subject, and the United States Government and the officers of residential schools were requested to give the committee such help as they could in the work.

The Eye of the Adult Imbecile.—Dr. C. A. Oliver (Philadelphia), from the examination of twenty young adult male imbeciles, drew the conclusions: That the eye of the adult imbecile is capable of proper functional activity. That, from early mental incapacity remaining practically unused for careful near work, it might be taken as a type of the healthy adult eye; and that many of the conditions seen in the adult eye of the mentally healthy must be regarded as pathological changes, representing general want of tone and constant or frequent abuse of a delicate organ.

Change of Form in the Eyeball, with Increased Refraction.—Dr. S. D. Risley (Philadelphia) reported nine more cases of eyes passing while under observation from hypermetropic to myopic refraction, by the turn-stile of astigmatism; the first and last states of refraction being determined with complete paralysis of accommodation. The importance of the existing astigmatism was insisted upon as a cause of eyeball distension; and its careful correction regarded as of great importance in the treatment of these cases. All of these cases (twenty-two), so far reported to the Society, were characterised by asthenopia, aggravated by the use of the eyes, retino-choroidal disturbance, diminished resistance to normal intra-ocular tension, and slow distension of the sclera. All were partially or completely relieved for a time by the use of correcting glasses, and in some the trouble returned only when these were neglected. In a much larger group of cases the same process was permanently checked by the use of correcting glasses. One case was that of a lady of about fifty, showing such changes were not confined to youth.

Dr. W. W. Seely (Cincinnati) thought lack of balance in the recti muscles a most frequent factor in such changes of refraction.

Dr. Risley tested this as a routine practice. In but three of these cases was the balance faulty. Two were relieved by tenotomy of the externi, the third by prisms. He felt confident astigmatism was the constant factor.

Change of Astigmatism by Unequal Contraction of Different Parts of the Ciliary Muscle.—Dr. H. Knapp asked the opinion of the members as to the occurrence of this by a voluntary contraction of particular parts of the muscle.

Drs. Seely, Burnett, Randall, Norris, Carmalt, and Theobald gave instances in which the degree of astigmatism could be varied by changing the conditions under which the eye was placed, as by varying the correcting glass, or using a mydriatic, but none in which the change was accomplished by the direct influence of volition upon the contraction of the ciliary muscle.

Dr. Risley had never been able to satisfy himself of the existence of such a power.

The Pathogenesis of Pterygium.—Dr. S. Theobald (Baltimore) urged that a theory to explain the causation of pterygium must account for its constant occurrence over the insertion of one of the recti muscles, usually the internal rectus. This is not explained by existing theories. The one recognising injury or ulceration of the cornea as the initial lesion ignores the fact that the process often starts in the conjunctiva some distance back and gradually grows up toward the cornea. The theory ascribing it to conjunctival irritation fails to account for its especial frequency to the nasal side of the cornea. These points may be explained by supposing it due to the influence exerted by use or fatigue of the recti muscles over the blood supply of the conjunctiva covering their insertion. Patients often give a history of recurrent hyperæmia of the part after use of the eyes. Then, too, the internal recti are more frequently and severely taxed than the other muscles, and are in closer relations with the conjunctiva covering their insertions. Dr. Lippincott's cases supported this theory.

Dr. D. B. St. J. Roosa : A history of commencement with traumatism is given in a large proportion of cases. Persistent hyperæmia over the insertion of the interni is quite common, but he thought it would not lead to such extensive proliferation of tissue.

Dr. Theobald · Doubtless rare cases are due to traumatism, but in 90 per cent. the pterygium is at the inner side of the cornea, and this corneal ulcers and traumatism will not explain.

(To be continued.)

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Realing, G. Clinical communications. (1) Cyst of iris destroyed with the galvano-cautery. (2) Syphiloma at the sella turcica, causing engorged papilla, and ending in complete recovery. (3) Granuloma sarcomatosum corneæ of seven years' standing.
Arch. of Ophth., June, 1887, *p.* 210.

Rolland. Les troubles visuels dans le diabète sucré sont-ils des troubles de consomption?
Rec. d'Ophth, 6, *p.* 334.

Schwalbe. Lehrbuch der Anatomie des Auges.
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TWO CASES OF "CONCUSSION CATARACT."

By J. B. Lawford, F.R.C.S.,

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The uncertainty which still exists as to the exact pathology of so-called concussion cataract, seems a sufficient reason for publishing notes of the two following cases, in each of which I have had the opportunity of examining the eyes after removal:—

Case 1.*—John L., aged 12, came under my care at St. Thomas's Hospital on June 9th, 1887. Seven days previously he was struck a severe blow by a "tipcat" on the right eye. This was followed by swelling and ecchymosis of the eyelids. In three days he was able to open them, and then found that he "could not see with the right eye."

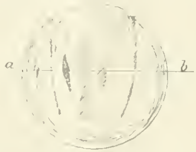
On admission the condition was as follows:—R., subconjunctival extravasation on temporal side; some conjunctival and ciliary injection. *Cornea* clear; no scar or other evidence of perforating wound. *Iris* detached at its periphery at upper part, and anteverted. *Lens* opaque throughout, the opacity being of nearly uniform density as seen from in front. It is apparently displaced slightly upwards and backwards. No p. l. T − 1. Some pain.

On June 10th the eye was excised. Its diameters and conformation were normal, and careful examination failed to reveal any perforating wound of cornea or sclerotic.

The eyeball was preserved whole, in Muller's fluid, for a month, and then opened by equatorial section and examined. As regards the posterior parts of the eye, it will suffice to say that there was some hæmorrhage in the vitreous, and between

* This patient was shown at the Ophthalmological Society's Meeting on June 9th, 1887, as a case of "Coredialysis, with complete Anteversion of the Detached Iris."

the choroid and sclerotic, and in the retina at Y. S. The lens was very slightly displaced, to a much less degree than appeared probable before removal of the eyeball. It was, however, dislocated slightly upwards, and tilted a little backwards, at its upper edge. The zonula had given way at this part, and the vitreous was bulging forwards between the ciliary processes and the lens margin. The rupture of iris was in this situation also. The lens was less uniformly opaque when seen from behind than it appeared to be anteriorly. Its circumference was rendered irregular by a slight prominence at the upper edge. Its posterior surface (see diagram) showed some unevenness, the middle part being raised a little above the lateral parts, and nearly in the centre of the posterior capsule was a small vertical gap, with a protrusion of semi-opaque lens substance through it. There was no other breach in the capsule.



Posterior Surface of Lens; black spindle-shaped patch is the rupture in capsule. The area between the two nearly vertical streaks is slightly elevated above the lateral parts.

Section of Lens through line *a b*.

The whole lens was imbedded in celloidin, and sections were made transversely so as to cut across the rupture in the capsule. On microscopic examination of the sections, the rent in the posterior capsule was very well seen; it was a little to one side of the midline of the posterior surface of the lens, and the capsule on one side (probably the temporal) of the gap was curled outwards upon itself, with two nearly complete turns, in an exactly similar way to that which occurs when the anterior

capsule of a fresh lens is opened. At the opposite edge of the rent no such curling had occurred. The capsule elsewhere was intact. The changes in the lens substance were most noticeable in the posterior cortical layers. Here the fibres had undergone considerable change, and there were numerous globular particles among them. In the part immediately adjoining the rupture nothing but irregularly globular (or nearly globular) masses, quite structureless in appearance, could be made out. the small notch in the lens being almost filled by them. Anteriorly, there were numerous small bubbles or vacuoles among the lens fibres, which were evidently loosened and separated to a moderate extent. The nuclear part of the lens presented an almost homogeneous appearance, the outline of the fibres being completely lost. The anterior sub-capsular epithelium was unaltered.

Case 2.—Mary Ann M., aged 50, a patient under the care of Mr. Waren Tay, to whose kindness I am indebted for permission to publish the case, was admitted to Moorfields Hospital on April 6th, 1887. In the previous January she was struck a severe blow on the left eye by the lash of a heavy whip.

On admission.—L., ciliary injection. *Cornea*, some punctate opacity at lower part. *Iris* detached at periphery down-out, and folded on to adjoining portion. *Lens* opaque. V = p. l. T + . Severe pain.

The eye was excised, and on examination after hardening in Muller's fluid, the following conditions were found :—No scar of perforating wound in the cornea or sclerotic. Retina and choroid *in situ*. Vitreous fluid, but clear. Iris and ciliary processes thickened; the former has been ruptured at lower and outer part at its root. A thin layer of soft lymph adheres to the posterior surface of the cornea in its lower $\frac{2}{3}$. Lens bulky, displaced very slightly upwards, and opaque throughout, though the density of the opacity is unequal in its different parts. The outlines of the lens are not quite regular. On the anterior capsule in the pupillary area is a small patch of lymph. In the posterior capsule, just behind the equator on nasal side, is a distinct rupture. The opacity of the lens substance, which is less in degree in the cortical layers generally than in the central part, at the site of rupture reaches quite up to the capsule, and there is a slight attempt at protrusion of the opaque matter

through the rent ; this is not nearly so marked as in Case 1, in consequence, presumably, of the greater hardness of a lens of this age. The condition of the suspensory ligament was, unfortunately, not noted. No microscopic examination was made.

The question at issue seems to be, whether or no rupture of the capsule of the lens occurs in those cases in which gradually increasing opacity follows a blow on the eye without perforating wound? Different writers have different opinions on this point, as a reference to the literature of the subject will speedily show, but there are very few recorded instances of examination of eyes containing such cataracts ; and I have found no record of a case in which a "concussion cataract" had formed, and in which the capsule was found intact after removal of the eye, though there are many in which it is noted that no rupture could be discovered by careful ophthalmoscopic examination. Many such eyes never come to excision ; the lens is needled and removed, or allowed to be absorbed ; of these cases nothing positive can be said on either side.

Von Graefe,* in a lecture on a case of traumatic cataract, says that in concussion cataracts rupture of the capsule usually occurs, and that the rent is always situated behind the equator of the lens. He adds, "sometimes, however, no tear in the capsule can be detected" (? by ophthalmoscopic examination).

Becker, writing in "Graefe-Saemisch.," Vol. V., p. 275, believes that "changes in the lens may occur from contusion of the eye, *without* rupture of the capsule or zonule." He records a case of rupture of the *anterior* lens capsule in a youth, aged 20, from a blow by a twig, without perforating wound.

De Wecker, in Wecker and Landolt's "Traité Complet d'Ophthalmologie," Vol. II., p. 885, thinks it very probable that a "simple commotion" of the lens

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* Berliner Klin., Wochenschr., 1864, p. 19, and O. R., 1866.

can cause cataract, and mentions recent attempts at maturation of cataract as favouring this view. He adds, however, that it is impossible to be sure in cases of injury that the lens was healthy before the blow ; and, of course, in cataracts which are artificially ripened the lens has already undergone much change.

Arlt* thinks that there are no irrefutable proofs that contusions of the eye, which do not involve either rupture of the lens capsule or tearing of the suspensory ligament, can give rise to changes in the lens.

Meyer† favours the development of cataract after contusions of the eye, without any lesion of the capsule, though he thinks rupture of the suspensory ligament may occur.

Our English authorities write in much the same strain. Dixon and Hulke, in Holmes's "System of Surgery," 3rd edition, Lawson,‡ and Nettleship§ mention the probability of rupture of the capsule resulting from blows upon the eye without perforating wound. Lawson adds, that in some cases, "without apparent injury to the lens capsule," the transparency of the lens will be destroyed. Soelberg Wells, in his Treatise on "Diseases of the Eye," gives von Graefe's opinion alluded to above.

The rarity with which specimens of this form of cataract can be obtained, doubtless explains the almost complete absence of records of pathological examination of this condition. The great difficulty, if not impossibility, of determining by means of the ophthalmoscope, the presence or absence of a small rupture in the posterior capsule, perhaps close to the margin of the lens, is evidenced in the carefulness of authors to state in reports

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* Uber die Verletzungen des Auges, p. 296.

† Transl. by Fergus, p. 326.

‡ Diseases and Injuries of Eye, 5th edition, and O. H. R., Vol. IV., p. 179.

§ Diseases of the Eye, 4th edition.

of cases that there was "no *apparent* rent," and the question can only be settled by careful examination of all excised eyes in which such a condition of the lens is present. These two cases may help to fill this gap in our pathological knowledge

THE POSITION OF THE FALSE IMAGE IN OCULAR PARALYSIS.

By Alex. S. Patton, M.B.,

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To remember the position and direction of the false image in the diplopia caused by paralysis of the various ocular muscles has always been a difficulty, not merely to students, but even to those who make a special study of ophthalmology. A method, therefore, which will assist us to remember at once these points seems to me to be a mnemonic worthy of publication. The directions in which the various ocular muscles draw the eye, which are easily remembered, form the basis of a scheme which I devised some time ago, by which the position and the obliquity of the false image can be remembered as well as the variations which these undergo in the different parts of the field.

If we take any one of the muscles and represent its action by a right line drawn in the direction in which the muscle normally acts, we may consider this as a force acting in a given direction and resolve it into two other forces acting at small angles to the original one. We have then three lines which represent the obliquity of the false image when that muscle is paralysed, in the case of the superior and inferior recti and of the obliques when the object is placed respectively to the right, in the middle line and to the left; and in the case

of the internal and external recti when it is placed above, in the middle line and below, the three lines representing the obliquities as they are drawn in the order seen; namely, the line drawn more to the right represents the obliquity of the false image when the patient looks more to the right, the line originally drawn to represent the action of the muscle represents the false image as seen in the middle line (either the vertical or the horizontal according to the muscle affected), &c.

At the same time these lines give the variations in the amount of the vertical and horizontal deviations, for according as the line is directed more upwards (and downwards) or outwards (and inwards) will the vertical and horizontal deviation be greater.

I suppose the diplopia to be tested in all cases by an object placed vertically, though the same method can be adopted if it were horizontal, only requiring slight modifications which are self manifest. An illustration will perhaps make the above-mentioned facts and their application clearer.

Let us suppose a case of paralysis of the *right superior oblique.* This muscle when acting normally pulls the eye downwards and outwards; it may therefore be represented by the line O A, the arrow head

FIG. 1.

(see Fig. 1) indicating the direction of action, and this may be resolved into O B and O C acting at small angles about O A. Now it will be seen, by a primary

consideration, that the diplopia only occurs when the object is placed below the middle line, and O B will represent the false image when it is placed to the left (non affected) side, whilst O C will represent it to the right (affected) side, O A representing the false image in the middle line. We now observe that the obliquity is greatest when the object is placed to the right and least when it is placed to the left, O C being more oblique than O A, and O A than O B; that the false image is displaced downwards and outwards; that the greatest amount of horizontal deviation occurs when it is placed to the right, and that the greatest vertical deviation occurs when it is placed to the left, as O C represents a force acting more outwards, and O B one acting more downwards. The entire diplopia can therefore be represented as in Fig. 2, the dotted line being the false image.

Right Superior Oblique.

Fig. 2.

Let us now examine one of the group to which belong the internal and external recti, taking as an example the *right external rectus*. The line of action of this muscle may be represented (Fig. 3) by a line O A resolved, as before, into O B and O C. Following the same method, it will be seen that the false image in the paralysis of this muscle is seen when the object is placed to the right side of the middle line; that the diplopia is homonymous; that the horizontal deviation is greatest when it is in the middle line, and less above and below; that above and below the middle line there is some vertical displacement respectively upwards and

downwards. Now, remembering that we use an object held vertically, we will see that in the middle line there is no obliquity of the false image, that above there is an obliquity (from below upwards) outwards, and that

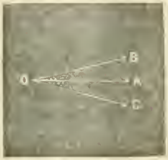

FIG. 3.

below there is an obliquity (from above downwards) outwards. If the object were held horizontally the obliquities would correspond to the lines in the figure. The diplopia then may be represented as in Fig. 4.

RIGHT EXTERNAL RECTUS.

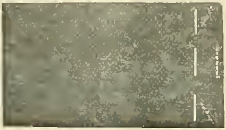

FIG. 4.

In a similar manner the diplopia in paralysis of any other ocular muscle can be at once remembered.

The detailed description of the above method may seem rather tedious, but its application in practice will be found extremely simple, as it is never necessary to actually draw the figures, and by simply remembering the action of a muscle the diplopia which would arise in the case of its paralysis can be at once drawn out. I have frequenty explained this method to students, and have found that once they had grasped the principle they were able to apply it without hesitation.

Westphal (Berlin). On a case of Chronic Progressive Ophthalmoplegia Externa, with description of Ganglion-cell Groups in the region of the Oculomotor Nucleus. *Archiv. für Psychiatrie, Bd. XVIII., Heft* 3.

Westphal is induced to record this case separately, because of his discovery, on microscopic examination, of groups of ganglion-cells in the region of the oculo-motor nucleus not yet described, the physiological meaning of which he attempts in the paper to decide.

The patient, a cooper, aged 44, came under Westphal's care in September, 1882, and died in October, 1883. His father suffered from mental deterioration before his death at the age of 43, and a sister is emotional and quarrelsome. Up to 1876 he had had excellent health, but at this date he suffered from "itch" (syphilis ?), and was treated by inunction. From this attack the patient dated his weakness, emaciation, and loss of vision. A year and a half before, he fell out of bed at night, and remained unconscious for three days. In August, 1881, he had a similar attack after a period of health. In this attack he was quite confused, and was paralysed in the right arm. After two days he recovered consciousness, and could move his right arm perfectly. In a third attack, eight weeks before, he fell down and remained unconscious for three days, and paralysed on the right side. For half a year he had suffered from delusions, and latterly had been hypochondriacal.

The patient, on examination, showed two definite scars on the penis, but otherwise no evidence of syphilis. The ocular condition was as follows :—Marked ptosis of left eye. Left pupil slightly narrower than right, and not reacting to light, while the right re-acts very slightly. Marked divergent strabismus, and complete absence of ocular movement in all directions. Eccentric vision of both eyes good. Vision of right eye not deficient ; of left eye $\frac{2}{3}$. Diplopia had been present. In November, 1882, Uhthoff found ophthalmoscopically nothing abnormal, but in February, 1883, he found the papillæ pale, and in April and May this pallor was more marked, although not sufficient to justify a definite diagnosis of atrophy. The pupils did not re-act to light. Accommodation unaffected. V., $R=\frac{6}{6}$; $L=\frac{2}{9}$. Visual field normal. Both eyes quite

motionless, the right turned slightly downward, and more covered by the lid than the left. In September, 1883, the pallor had not increased, so that there was no progressive optic atrophy, and in agreement with this the autopsy showed a slight increase of interstitial tissue, the fibres remaining practically normal.

The tongue, protruded straight, showed fibrillary tremor, and a slight thinning in the middle third along the left edge, with longitudinal furrows on the upper surface of the left half, the right being smooth. The speech was not characteristically paralytic, but was blurred, nasal, and monotonous, with omission of syllables in long words. Palate movements deficient, but swallowing normal. Sensibility of face much diminished. Taste uncertain. Smell very deficient (chronic nasal catarrh).

Lower extremities not wasted; gait fairly firm; but the right leg in walking more raised from the ground than the left, either from ataxy or from deficient dorsal-flexion, due to the old right paresis. In the horizontal posture the right leg could be elevated *ad maximum*, but always with slight adduction, which was not the case with the left. Left knee-jerk only just elicited; right absent. Cremasteric and abdominal reflexes present. Frequent incontinence of urine. With the exception of pain in the left shoulder, there was no evidence of disease in the upper limbs, or in the trunk.

The mental derangement, on account of which the patient was brought to Westphal, consisted of hypochondria and delusions. Latterly, his mental condition markedly deteriorated, and he lost in weight. His eyes remained motionless till his death in October, 1883, from œdema of the lungs.

The notes of the autopsy are as follows:—The pia mater on the convexity is œdematous, thickened, and easily detached. In the pia mater, on the under surface of the pons and medulla oblongata, is a thin, fresh clot. The cortex and medulla are unaltered. The sixth nerves are reduced to extremely thin grey threads—the right is slightly the thicker. The third nerves are grey, and diminished by about two-thirds of their circumference. The fourth nerves were not seen. The ocular muscles are yellow in colour, or striped yellow, the superior recti being most natural in colour. The spinal pia

mater and nerve roots are normal, but from the dorsal region downward there is evident grey degeneration of the posterior columns of the cord.

In addition there was also marked dilatation of the ascending aorta with much atheroma, Endarteritis chronica deformans, fibroid pneumonia of the left lung, and œdema with hypostasis of both.

The symptoms in this case were those of general paralysis of the insane, along with almost complete ophthalmoplegia externa, and partial atrophy of the left half of the tongue, and symptoms pointing to incipient tabes. Although undoubtedly syphilitic, there was no definite evidence that the patient owed his illness to that disease.

Portions of the brain and the cord were hardened in Müller's fluid and examined microscopically. The oculo-motor nucleus show advanced degeneration, very few ganglion-cells remaining, and these round, shrunken, and without processes. The oculo-motor nerves, stained by Weigert's method, appear light brown in place of black, but by the high power they show here and there fine black medullary fibres. The muscular nerves frequently show only one black fibre in the field.

Dorsally from the atrophic oculo-motor nucleus and in the upper part of the column of the nucleus as far as the posterior commissure, there can be seen in the sections, of which Westphal gives several beautifully executed plates, a group of ganglion-cells (*median*) lying on each side of the raphe, oval with the long axis partly parallel, partly oblique to the raphe. On the level of the upper extremity of this group, but laterally on each side is a second group (*lateral*), also oval, but with long axis horizontal. The ganglion-cells of these groups are well developed, staining well by Weigert's method, but better with nigrosin, on an average smaller than those of the normal oculo-motor nucleus. There are, therefore, on each side three groups of cells, the oculo-motor nucleus here degenerated, a median and a lateral group. The two last groups are separated by a band of fine nerve fibres passing downward to the crusta of the cruscerebri, which are evidently continued from the cells of both groups. This band widens out above, and thus, with the raphe, completely surrounds the median group of cells.

The nucleus of the fourth nerve shows no degeneration of its ganglion-cells, but a distinct diminution in its smaller cell-groups, and the fine nerve-fibres visible in its area in normal preparations. The roots of the nerve and its terminations in the superior oblique are also greatly degenerated, so that although the trunk of the nerve was lost, there can be no doubt that it was degenerated.

The nucleus and trunk of the sixth nerve show extreme atrophy, the ganglion-cells deficient both in number and size, and the root-fibres being scarcely perceptible.

At the lower extremity of both hypoglossal nuclei the ganglion-cells are deficient, but the portion of the right nucleus thus affected is small, while a full third of the left nucleus is completely atrophic.

The condition of the optic nerves has been already referred to. It is not simple atrophy such as takes place in tabes, but a thickening of the connective-tissue septa, this change extending to the very finest subdivisions, involving only part of the circumference of the nerve, and of less intensity near the eyeball.

The spinal cord shows degeneration of the posterior columns along its whole length, involving both their median and lateral portions Plates are given showing the condition in the different regions.

It will be seen that the case recorded is of interest in various ways, but specially in regard to the meaning of the cell-groups named by Westphal, the *median* and the *lateral*. In discussing this, Westphal in the first instance points out that the bundle of fine fibres separating the two groups evidently springs in great part at least from the cells of the groups, and also evidently passes downward as root-fibres, forming but little connection with the posterior longitudinal bundle. This fact, making it probable that the cell-groups give origin to oculo-motor fibres, is strengthened by the further fact that von Gudden, Edinger, and Darkschewitsch have described similar cell-groups in new-born animals and human embryos, and have regarded them as most probably associated with the oculo-motor nucleus. The reason Westphal suggests, why these groups, which are of constant and normal occurrence, have not been described in adults in our anatomical text-books may be

the fact that they lie far forward, in front of the region indeed where sections of the oculo-motor nucleus are usually made. The relative position of the cell-groups does not seem to be the same in adults as in embryos, but Westphal suggests that this point requires investigation.

Now as to the physiological meaning of these groups. It is to be noted that the cell-group ordinarily known as the oculo-motor nucleus was almost entirely degenerated, that in accordance with this the external ocular muscles were all more or less degenerated ; that on the other hand the median and lateral cell-groups were healthy, and that also the internal ocular muscles, the sphincter pupillæ and ciliary muscle, were active. It is naturally suggested that these internal muscles are innervated by the cell-groups in question. And this conclusion is in full accord with the clinical results of Kahler and Pick, and the experimental results of Hensen and Völkers, both of which place the origin of the fibres supplying the sphincter pupillæ and the ciliary muscle in the anterior part of the oculo-motor nucleus. The reflex immobility of the pupils to light in this case Westphal attributes to the tabetic or general paralytic lesion. The position of the lesion in these diseases which causes their pupillary symptoms we do not know, but for various reasons, as Westphal says, the above-mentioned cell-groups cannot be made responsible for them.

PERLIA (Frankfort-on-the-Maine). **On the Hereditary Transmission of Eye Diseases.** *Klin. Monats. Bl. f. Augenheilk, May*, 1887, *p.* 197.

E. TREACHER COLLINS (London). **On Anophthalmos.** *Roy. Lond. Ophth. Hosp. Reports, Vol. II., Part.* 4, *p.* 429.

The author discusses the general subject of congenital malformations of the eye in connection with a remarkable case observed by himself, in which a well-marked congenital defect was apparently attributable to disease of the eyes of the mother in the first month of pregnancy.

A healthy woman, married to a healthy man, bore five children. The two first children had normal eyes. In the first month of the third pregnancy the woman was attacked by

a severe inflammation of both eyes for which atropine was ordered by an oculist, and which resulted in sub-central opacities of both corneæ. At the termination of labour the midwife told the mother that the new born child had only one eye. The two children born subsequently had normal eyes like the two eldest.

The affected child, a girl, was seen when five years old by Perlia. She was markedly rachitic, with enlarged epiphyses, and bad teeth; her mental faculties sound. *Right eye:* Coloboma of iris and choroid; cornea egg-shaped with the narrower end downwards, where the corneo-scleral junction was ill-defined and the sclera flattened. The margins of the gap in the iris strongly pigmented, and, to a breadth of about one millimeter, thinner than the rest of the membrane; the true pupil margin not abnormally pigmented. The margin of the gap, therefore, appeared to consist of the uveal layer only, the gap in this layer being narrower than in the anterior layers of the iris; (Reuss has described a case of iris coloboma in which the defect existed in the anterior layers only, the gap being spanned by the unbroken uveal layer); a coloboma of the choroid of the usual kind, not reaching to the papilla. *Left eye:* Anophthalmos; eye-lid reduced in height; lid-aperture 11 mm. horizontally, against 20 mm. in the fellow eye; lachrymal puncta and gland present. Vertical diameter of the orbit 23 mm., against 28 mm. on the other side; its upper margin not arched, but sloping downwards and outwards nearly in a straight line, no eye-ball visible; in its place a funnel shaped hollow, lined with conjunctiva, movements of which in association with movements of the right eye revealed the presence of the muscles; at the apex of this hollow, which was too small for examination with the finger, a glass rod discovered a solid body as large as a pea.

There was, therefore, an arrest of development of the eye on both sides, the pea-shaped body being the rudiment of the left eye, the coloboma the result of a slighter interference in the right. Why the greater defect here, as in most cases of the kind, was on the left side, remains unknown; Manz has suggested its possible connection with the sideways position of the fœtus in the womb. (This alleged preponderance is not

supported by the statistics collected by Collins. See below.) Unilateral anophthalmos is rare; among 108,466 patients Mooren saw three cases only.

With regard to the cause of the defect the author points out that from the third to the fourth week after impregnation is the period in which the optic fissure is formed in the fœtus, and that the developmental changes in this region are very active at this time, and hence especially liable to inflammatory perversion with consequent maldevelopment of the eye. It was precisely at this period that the eyes of the mother were affected with a severe ophthalmia.

The question as to how far the system of the fœtus is liable to be affected by influences acting upon the mother deserves further study. We know that in the individual organism secretion and nutrition are accelerated or disturbed by strong mental impressions, but how far such effects are transmissible from the maternal to the fœtal organism is still a matter of speculation. With regard, however, to the transmission of actual bodily defects there is no question; the child frequently inherits, if not a precisely similar defect, at least a defect of the same organ. The eye appears to be especially liable to such inheritance, by reason probably of its highly complex structure. The probability that the fœtus will be affected appears to be the greater, the longer before conception the structural or functional disturbance has been acquired by the mother. Defects which are congenital in the parents are therefore the most apt to be transmitted, but it is well established that transmission may also occur in the case of acquired defects. Certain experiments by Samelsohn and Deutschmann have proved this clearly in the case of the lower animals. With regard to transmission of ocular defects due to damage to the eyes of the mother occurring during the period of pregnancy, Perlia's observation supplies probably the only case on record.

Collins reports a case of bilateral anophthalmos, and gives an admirable analysis of all the observations hitherto made concerning congenital absence of one or both eyes. (Perlia's case, above noticed, is not included in the list, having been published at a later date.) He collates thirty cases of bilateral, and twelve of monolateral anophthalmos, but declines to infer,

as other writers have done, that the latter are decidedly less frequent than the former, on the ground that many observers would think the absence of both eyes more worthy of record than the absence of one.

Analysing the cases with regard to age, sex, family history, co-existence of other deformities, and mental and bodily development, he finds that, as a rule, sufferers from congenital bilateral anophthalmos are born of healthy parents unrelated; are themselves healthy, well formed, and free from other abnormalities; that they belong about equally to the two sexes; and that few, if any, live to the age of puberty.

Of twelve cases of monolateral anophthalmos, the right eye was absent in six, the left in five; in one there is no note. (Perlia's case makes the numbers equal.)

Post-mortem examinations have been made in nine cases of bilateral anophthalmos. In no case could any trace of an eye-ball, or of anything representing it be found. In no case was the optic nerve found to enter the orbit; in one it ended in a cone-shape at the optic foramen, in another in a fibrous filament, in five the chiasma was absent. In these cases evidently no primary optic vesicle had budded out from the anterior primary encephalic vesicle, or having budded out it had failed to form a secondary optic vesicle. In spite of the entire absence of the eye in these cases, the appendages of the eye which are developed from cuticular epiblast and mesoblastic tissue usually reach a considerable degree of development, being well-formed though small. In an allied class of cases, on the other hand, termed cryptophthalmos, four of which have been examined post-mortem, a rudimentary eye was found in each case. In these cases the parts of the eye developed from the secondary optic vesicle were perfect, while the lids and conjunctival sacs and parts developed from mesoblast and cuticular epiblast were wanting or mal-formed, the process of development apparently being arrested at the formation of the lens. (Hocquart, Archives d'Ophth., Vol. I, p. 289.)

With regard to the interesting question as to the primary cause of these abnormalities, Collins found that in twelve cases, including his own, some maternal impression or fright was said to have occurred during pregnancy. In six of these,

the maternal impression occurred during the first month, and may, therefore, he thinks, be reasonably regarded as the disturbing agent. We believe that in a considerable number of cases of less pronounced congenital defect in the eyes, especially in many cases of congenital cataract, a maternal shock or strong mental impression will be found on enquiry to have occurred during pregnancy.

AMERICAN OPHTHALMOLOGICAL SOCIETY.

TWENTY-THIRD ANNUAL MEETING,

HELD AT NEW LONDON, CONN., JULY 20TH AND 21ST, 1887.

President—Dr. WILLIAM F. NORRIS, of Philadelphia.

Reported by EDWARD JACKSON, M.D.

(Continued from page 277).

Recurrent Retinal Hæmorrhage, followed by the Development of Blood Vessels in the Vitreous.—Dr. S. Theobald had previously seen the patient for refractive troubles. In April, 1886, there was conjunctival injection, pain, and dimness of vision. The ophthalmoscope showed small hæmorrhages above the disc, which increased in number. The diagnosis was made of thrombosis of the upper retinal vein. In August, vision had risen to $\frac{20}{XX}$. In September, fresh hæmorrhage occurred. In October, there was a mass, looking like a globule of blood, below the disc. In January, 1887, there were more hæmorrhages. By the end of February, vision again $= \frac{20}{XX}$ A month later, a floating opacity was discovered in front of the disc. It was found to consist of small blood vessels, held together by a semi-opaque connective tissue. In June, the opacity was smaller, and vision $= \frac{21}{XX}$ mostly. No more hæmorrhages.

Dr. W. H. Carmalt reported the case of a man who in February, 1877, came for sudden blindness of the left eye, the vitreous being filled with blood. In August the vision of the right eye was lost in the same way; and hæmorrhage was found in the vitreous, with choroidal changes. In January, 1878, the left eye was again affected. When this hæmorrhage cleared up there were floating opacities in the vitreous, and a mesh-

work of blood vessels extending forward from the fundus. The nerve was pale, the veins rather large, and the arteries small. The condition of this eye and the new vessels of the vitreous continue the same. Every few months he has a fresh attack of hæmorrhage in the other eye. The vessels seem to come from a point outside the nerve.

Dr. O. F. Wadsworth had seen ten years ago, in a man then over 30, extensive hæmorrhage into the vitreous of one eye. As this cleared up there occurred hæmorrhage in the retina of the other eye, which presented spots of perivasculitis near the equator. Again the first eye became almost blind from hæmorrhage, and when the vitreous now cleared the retina could be made out through a transparent membrane which carried blood vessels in the vitreous. Some of the vessels could be traced to their connection with those of the retina. Two years ago there had been no recurrence of hæmorrhage for over a year. The other eye soon returned to the normal condition. In a man, aged 23, there was sudden blindness from great hæmorrhage into the vitreous. This cleared up, but there was a recurrence, after no special exertion, just as he was getting into bed.

Dr. H. Knapp had treated these cases as he did lesions of the choroid. But a very important point was to avoid fatigue of the eyes, and to put them to rest early in the evening. A waitress almost always had a hæmorrhage when the family with whom she lived gave an evening party. Ordinarily she had rather an easy time, but on such occasions was kept up late and much fatigued.

Embolism of the Central Retinal Artery.—Dr. Geo. C. Harlan (Philadelphia). A clerk, aged 52, in good general health, while reading with perfect comfort, suddenly noticed a shadow before his left eye. Closing the other eye he could just distinguish large objects through a "brownish mist," and in a few minutes sight was entirely gone. An ophthalmoscopic examination next morning showed extensive oedema of the retina, giving the whole fundus a grayish tinge; disc pale, its margins blurred; arteries very pale, though not much narrowed, and some of the smaller branches lost in the retinal oedema; large veins contracted in places, particularly on and near the disc, but generally of full calibre; phenomenon of visible,

slow, continuous circulation of the blood in bead-like sections, well marked in superior temporal artery and vein; macula occupied by a bright red patch oval in form with long diameter horizontal, and several of the minute terminal vessels near it unchanged and apparently isolated; two small dots of retinal hæmorrhage at the outer margin of the disc. The oedema increased decidedly for the first few days, and then gradually subsided. A little remained at the nineteenth day; but three weeks later the colour of the fundus was normal. The visible circulation lasted about a day and a half, disappearing first in the artery. The veins refilled at their narrowed portions, and retained nearly their normal calibre; while the arteries became paler and narrower, until only the two main trunks could be seen, and these showed white lines along their margins from perivasculitis. The spot at the macula gradually disappeared. The disc became distinct in outline and dead white. (Coloured plates were shown illustrating the first and final appearances of the fundus.) The pathology of the case was very obscure; heart and kidneys normal, and no sign of arterial degeneration. The only local disease was caries of the middle turbinated bone on the same side.

Simple Glaucoma.—Dr. D. Coggin (Salem, Mass.) reported a case where one eye had slowly become blind; and vision in the other was reduced to $\frac{3}{4}$, tension increased. Eserine had no good effect. Iridectomy was done, and the eye had lost nothing in the eighteen months that had since elapsed. Did not iridectomy offer these cases more hope than other measures?

The Danger of Using Old Hammers.—Dr. G. C. Harlan's attention had been called to this by a sufferer. By long use the metal becomes crystallised and very brittle; and a layer forms at the surface very liable to be chipped off. A hammer with such a layer was shown.

Retinitis Pigmentosa treated by Electricity.—Dr. M. Standish (Boston) reported the case of a woman, aged 33, myopic 1·50D., who had worn correcting glasses since she was 17. In April, 1886, her sight had been failing three years, and very rapidly for the last three months. There were characteristic patches of retinal pigment in the periphery of the fundus of each eye. Vision was, right $\frac{12}{XL}$, left $\frac{12}{L}$; and the fields were less than

20° in their vertical and horizontal axes. The only treatment has been the use of the constant current, of such strength as could be easily borne, once in five days, during the last fifteen months. Her present vision is, right $\frac{12}{xxx}$, left $\frac{12}{xv}$; and the fields have vertical and horizontal axes of 70°. She now goes on the streets alone after dark with safety.

Dr. H. Derby (Boston) had treated a case in the same way, with great improvement in central vision, widening of the fields, and restoration of colour perception for red and green, which had been entirely lost.

Congenital Zonular Opacity around the Fovea.—Dr. O. F. Wadsworth (Boston) reported a case occurring in a female infant 11 months old, of Jewish parents, father healthy, mother in poor health, sixth child, the first four healthy, the fifth had died at 18 months. Its muscular system was undeveloped, and it took little notice of things about it. During the ophthalmoscopic examination it fixed the mirror. Greater part of the fundus normal, as was the fovea. Around the fovea was a zone, one and a half times the diameter of the disc, of grey opacity, over which small retinal vessels could be seen. Five months later no notice was taken of the mirror or of anything else. The discs grey, and devoid of small vessels. Pupils responded very little to light. The child was thinner. Muscles still undeveloped.

Dr. H. Knapp had seen a similar case, which apparently improved greatly last summer, but during the winter grew worse and died. The discs were at first pale, and later became completely atrophic. An autopsy showed arrest of development in the cerebral cortex and other parts of the nervous system. Such cases would be more frequently recognised if ophthalmologists were oftener consulted in cases of brain disease in infants.

Albuminuria of Pregnancy, Separation of the Retina.—Dr. O. F. Wadsworth had seen a woman seven and a half months pregnant, urine containing albumen and casts, oedema of the lids, and indistinctness of vision, found to depend on extensive detachment of the retina in both eyes. After one-sixth grain of pilocarpine hypodermically the detachment diminished, and still more after a repetition of the dose; but the retina became more affected by grayish opacity. Premature labour came on, with convulsions, and for sixty hours she was unconscious; at

the end of that time only motion of the hand before the eyes could be recognised. Two weeks later vision was improving, but there was extensive gray opacity of the retina, with patches of white exudation and small hæmorrhages. Six weeks later there was no detachment of either retina; and vision is still gradually improving.

Dr. S. D. Risley thought there were cases of retinitis connected with albuminuria of pregnancy, which must be cut short. He had reported one last year; and had since seen another, where only light and shadow could be perceived. The patient soon after aborted spontaneously in the sixth month. The intense swelling and "snow-bank" exudation in the retina have entirely disappeared; and vision has improved greatly.

Coloboma of the Iris, Choroid, and Nerve.—Dr. B. A. Randall presented drawings of cases. It had been claimed that "underlying conus" was a variety of coloboma, but here one of the cases presented both conditions. In another, the bottom of the coloboma of the nerve was 13 D. more myopic than the adjoining fundus.

A Peculiar Form of Granular Conjunctivitis Associated with Ichthyosis.—Dr. F. Buller (Montreal) reported two cases occurring in boys suffering from ichthyosis. The first, aged 15, had suffered from rheumatism and iritis two years before, and six months later from asthenopia. Parents healthy and free from skin disease, as were four older children; but two younger brothers also had ichthyosis. The second was 7 years old, with "weak eyes" for two or three years. Parents free from skin disease. There was hyperæmia of the ocular conjunctiva; corrected vision, $\frac{6}{6}$. In both the conjunctiva of the lower lid was swollen, smooth, pale, and glazed, and presented tenacious yellowish mucus. The upper lids were thickened, the conjunctiva pale and smooth, but presenting flattened elevations (some mushroom-shaped), semi-transparent, containing minute red dots, and extremely hard. Microscopical examination showed these masses to consist of very highly-developed granulation tissue, mainly white fibrous tissue. The first case was treated for a year with the various trachoma remedies without improvement. He had seen other cases presenting the same local lesions equally rebellious to treatment, but had not examined them for the skin

disease. There seemed not the least tendency to acute exacerbations. The conjunctival secretion was entirely different from that of ordinary trachoma. It could not be contagious, for each patient mingled freely with several brothers and sisters, none of whom had any eye disease. The lesions were most marked on the upper lid, where the structure of the conjunctiva is most like that of the skin. He proposed to name the affection Ichthyosis of the Conjunctiva.

Modifications of the Ophthalmoscope.—Dr. W. S. Dennet (New York) showed his *electric light attachment*, or handle, for the ophthalmoscope, with a cheap battery to supply the needful current. He found it especially easy for beginners to get a good view of the fundus with this arrangement, and that the light was better and more manageable than the ordinary lamp or gas burner. It was made by Meyrowitz, of New York.

Dr. L. Howe showed an ophthalmoscope with a good lens-disc, which packed into the compass of a small pill box.

Dr. S. D. Risley presented *an ophthalmoscope with cylindrical lenses*. He had modified Loring's ophthalmoscope by adding two slides, like those proposed by Dr. Jackson, which moved just back of the mirror. These slides contained convex cylindrical lenses with their axes parallel to the stem of the instrument. One contained 0·50, 1, 1·50, 2, and 2·50 D; the other 0·25, 3, 4, 5, and 6; giving, singly and combined, 0·25 D intervals up to 3 D, and 0·50 D intervals to 8·50 D. The spherical lenses were the same as those in Loring's new ophthalmoscope. The direction of the cylinder axis was changed by varying the handle from the perpendicular. In most cases the variation needed would be but slight; but it could be carried even to the horizontal. The instrument was made by Queen and Co., of Philadelphia.

Dr. S M. Burnett exhibited an ophthalmoscope with (1) a clip on the back to hold the cylindrical lenses of the trial case, and a graduation around the edge of the mirror plate showing the direction of the cylinder axis. This is useful in verifying the diagnosis of astigmatism, and enables us to see clearly the fundus of an astigmatic eye. (2) Two superimposed discs contain lenses which singly, and in combination, give forty-seven numbers (22 plus, 25 minus) with a regular interval of 0·50 D up to 10·5 D. (3) A plane circular mirror, in front of

which is swung a tilting mirror. The plane mirror does not interfere with the use of the other, and when it is to be used alone the other can be detached from its upper bearing, and will swing, on its lower bearing, out of the way. Made by Queen and Co., of Philadelphia.

Dr. O. F. Wadsworth had for years used such a clip for cylindrical lenses, and thought Dr. Noyes had shown it before the Society.

Dr. Burnett did not claim originality, he had combined, in convenient form, things before used on different instruments.

Dr. E. Jackson thought, since astigmatism blurs the retinal image only half as much as H or M of the same degree, and since 0·50 D was the smallest interval of practical value between successive spherical lenses in the refraction ophthalmoscope, that the interval between the successive cylindricals should be a whole dioptry. The Loring ophthalmoscope might be greatly improved by adding the two slides, placing in one the lenses now placed in the quadrant, which could be dispensed with, and in the other concave cylindricals 1, 2, 3, 4, and 5 with their axes perpendicular to the stem of the instrument. He would use the concave cylindricals because, for himself (and on theoretical grounds he believed it true for all) it was easier to determine accurately the refraction in the meridian of least refraction, commonly the horizontal meridian (vertical vessels), and when this had been done, simply bringing up the proper concave cylindrical would make all the vessels equally clear. Still, for his own use, he preferred to get rid of the rekoss-disc, use the slides for spherical lenses (see "Ophthalmic Review" for January, 1887), and place the cylindrical in a clip back of the instrument.

Drs. W. S. Dennett and P. A. Callan had independently tried using a small Stokes's lens back of the ophthalmoscope, but had both abandoned it for the cylindrical lenses from the trial case.

Dr. B. A. Randall was still using the arrangement of cylindrical lenses, shown the Society a year ago, and with entire satisfaction.

Photographs of the Fundus of the Living Human Eye.—Dr. L. Howe (Buffalo) showed a series of these. The length of exposure was about fifteen seconds. The original negatives had

to be very small to get an impression, and from these enlarged positives were obtained. The great difficulty had been to get a formula for a plate sufficiently sensitive to the red rays returned from the fundus.

Small Test Lenses and Trial Frames.—Dr. E. Jackson (Philadelphia) exhibited a set of test lenses, made only one inch in diameter. This decrease in size effected a saving of one-half in the weight of lenses and frames. They were made plano-convex and concave, lessening spherical aberration, making it easier to combine them, and fitting them better for testing the strength of spectacle glasses by neutralisation. Additional lenses were introduced, including two "astigmatic lenses," such as he had found extremely useful in detecting the presence or exact amount of astigmatism. In the trial frames the temple was attached near the bottom of the lens carrier, instead of opposite the middle, so that lenses could be removed or introduced in the most convenient direction, viz., directly toward the temple.

Cases.—Dr. E. Jackson presented for Dr. C. A. Oliver sketches of two cases, one of double chorio-retinitis with partial degeneration of the optic nerve and curious lymph extravasation into the retina and vitreous, and the other of coloboma of the iris lens and choroid.

Transient Myopia after Iritis.—Dr. John Green (St. Louis) had noticed an increase of 1·50 D in his own myopia after an attack of iritis, which gradually disappeared. He had since noted the same phenomenon in some patients, and believed it a consequence of the iritis.

Dr. O. F. Wadsworth had also observed myopia which gradually diminished after recovery from iritis.

Rapid Developement of Cataract.—Dr. B. A. Randall (Philadelphia) had been consulted by a man, aged 22, myopic 2·50 D, for a spot before the right eye, first noticed within ten days. There was moderate choroidal disturbance, and well-marked posterior polar cataract, which he could not believe to be of such recent origin until within the succeeding month the opacity rapidly changed its shape, extended, and became obscured by a similar opacity starting from the anterior surface of the lens.

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THE TARSOCHEILOPLASTIC OPERATION FOR THE CURE OF TRICHIASIS.

By Dr. Edwin van Millingen, of Constantinople.

Upwards of one year has elapsed since Mr. Arthur Benson's publication in the Ophthalmic Hospital Reports on trichiasis operations. In both this, and Dr. Story's able essay on the subject (O. R., Vol. IV., p. 72), mention was made of my operation for the cure of trichiasis. This method, for which I have suggested the name of the "tarsocheiloplastic" (conveying the idea of reconstruction of the lip of the tarsus), has been practised by me for nearly ten years: the method during that time has undergone certain modifications with the object of making it as simple an operation as possible, and also of securing its success even in the worst of cases.

A few numbers will show how frequently trichiasis is met with in this country:—The number of patients seen suffering from granular lids, between the years 1877 and 1885, amounted to 3,304. Of these, 401 were afflicted with trichiasis, and 280 consented to an operation. The majority of those who refused to submit to an operation pleaded that it often fails to effect a permanent cure. This opinion, I consider, well founded, having often seen relapses after the older operations. I believe that experienced oculists would willingly adopt any method which offers better prospect of success than either Arlt's or Streatfield's operations. Spencer Watson's and Dianoux's operations were welcomed by the profession, but do not appear to have been generally adopted. I believe that the weak point by which they are condemned

to failure has been the unfortunate idea of attempting to give support to the ciliæ by transplanting a strip of skin on to the intermarginal space, that skin being known to contain hair on its surface, the very material which it is our object to remove from contact with the cornea. The imperfections of the earlier plastic methods could only be removed by transplanting tissue not containing hair on its surface, and, furthermore, better suited for contact with the cornea. After several experiments, more or less successful, I gave the preference to mucous membrane taken from the lower lip of the patient. Before describing the operation as I have practised it for fully two years with the most satisfactory results, I shall attempt to prove that the older operations for trichiasis are based upon an erroneous conception of the pathological change of the diseased eyelid, and should, therefore, be given up altogether.

In all cases of trichiasis following trachoma it will be observed that there is considerable shortening of the inner surface of the lid. The space between the free margin of the lid and the fundus of the fornix (I shall for sake of brevity name this space the *conjunctival surface*) is shortened through atrophy and cicatricial shrinking of the conjunctiva. The normal length of the conjunctival surface is about 2 cm., but in trichiasis it may have become shortened to 1 or 1·50 cm. Now, the shrinking of the conjunctival surface can only take place at the expense of the outer, *i.e.* the *cutaneous surface* of the lid. The ciliæ are drawn inwards by this traction, and this state constitutes partial or complete trichiasis. The lid having once been inverted towards the cornea, the action of the orbicularis is also modified; its pressure is no longer equally divided over the entire surface of the lid, but a greater part of its action is brought to bear upon the margin of the lid. Hence, the most important modification in trichiasis with entropium is the disproportion between the cutaneous and conjunctival surfaces, and the derangement in the

physiological mechanism of the lid. It will be seen that my method aims at doing the only thing which under such circumstances it is indicated to do, namely, at preventing the traction of the *conjunctival surface* from exerting any further traction upon the *cutaneous surface.*

The older operations for trichiasis have constituted a series of attempts to remedy the malposition of the lid, either by counteracting the shortening of the conjunctival surface by means of excisions of the cutaneous surface, or else by straightening the incurved tarsus. Arlt's operation, as it was formerly practised, aimed at shortening the cutaneous surface and increasing the distance between the ciliæ and the conjunctiva. The traction from within was disregarded, and no attempt was ever made to modify it directly. Other operations have been guided by the erroneous idea that the cause of entropium and trichiasis was to be sought in the abnormal action of the orbicular muscle. It appears to me, as I have already remarked, that the action of that muscle in the distorted eyelid is no longer guided by the mechanical laws governing the normal eyelid, but by the new state of things resulting from the traction from within. The shorter the conjunctival surface becomes, the more must the eyelid be drawn inwards. As the eye rolls upwards in order to keep the cornea away from the friction of the margin of the lid, the inward traction increases and the margin of the lid is inverted more and more. The irritation which ensues produces more and more violent blepharospasmus, and the entire pressure of the orbicularis is brought to bear upon the margin of the lid. The perverse action of the orbicularis is only an effect, the cause lying in the traction of the conjunctival surface.

Operations calculated to effect a cure by shortening the cutaneous surface may only prove effectual if this surface is made shorter, or at least, as short as the conjunctival surface. To shorten the former to the extent

of 1 or 2 cm. means to produce lagophthalmus, a state which is worse than the disease of which the patient desires to be relieved. But even after such extensive excisions of the cutaneous surface, the trichiasis may remain unaltered, and persist notwithstanding the lagophthalmus. I have witnessed such cases frequently, excision of the cutaneous surface being largely practised in Turkey by empirics.

The probabilities of success after Arlt's operation depend entirely upon the extent of conjunctival surface. In conversation some years ago with the late Professor von Arlt on this subject, the eminent professor remarked that the most frequent cause of relapse after his method was the subsequent retraction of the conjunctiva, and he stated that to avoid danger of relapse it was advisable to wait until the retraction was complete. Since that time I have directed my attention to this special point. I have found that it is only possible to succeed in effecting transplantation by this method without producing lagophthalmus, when the conjunctival surface measures at least 2 cm. If any less there is no possibility of maintaining the transplanted ciliæ in their new position without at the same time producing lagophthalmus. But even after successful operations on lids having a conjunctival surface only slightly shorter than in the normal state, there is good ground for believing that the inner surface will in course of time retract to the maximum of retraction, and this subsequent shortening may be sufficient to undo all that the operation has accomplished. As it is generally impossible to postpone an operation until the maximum of retraction has been reached, the surgeon is placed in a dilemma ; he has to choose between two alternatives. Either he must practise von Arlt's operation with the prospect of a relapse, or else he must pronounce the case to be an incurable one.

The object of my method is the establishing of a barrier between the conjunctival and cutaneous surfaces

by the formation of an immovable surface at the intermarginal space, which will prevent the traction of the conjunctiva from drawing the cutaneous surface inwards. After my operation, there is a solution of continuity between conjunctiva and cutis, and, however strong the traction from within, it cannot affect the cutis and the row of eyelashes to the same extent and as directly as before.

The operation is thus performed :—The intermarginal space is split from end to end, as in Arlt's operation, and sufficiently to produce a gap 3 m. in breadth at the central part of the lid, and gradually becoming narrower towards the canthii. The gap is kept open by sutures passed through folds of skin on the upper lid (see fig. *a*, *a*, *a*), and by means of which the lid is prevented from

closing for twenty-four hours at the least. As soon as the bleeding has ceased, a strip of mucous membrane of the same length as that of the lid, and 2 or 2½ mm. in breadth, is cut out with two or three clips of a curved pair of scissors, from the inner surface of the under lip, and placed at once into the gap at the intermarginal space. It should then be pressed into *situ* with a pledget of cotton wool steeped in sublimate solution. Sutures

are altogether superfluous, and do more harm than good. The operated lid is then covered over with a flap of linen containing a thick layer of iodoform vaseline, and this is covered over by cotton wool. Both eyes should be bandaged. I invariably use sublimate lotion (1 : 5000) for disinfecting the eye and lip, during, before, and after the operation. The bandage should be renewed once in twenty-four hours, and the sutures on the upper lid ought not to be removed before the second day.

I do not think it advisable to transplant small strips of mucous membrane if the trichiasis is partial; this condition being only the commencement of complete trichiasis, I strongly recommend the filling up of the whole length of the intermarginal space with a flap of mucous membrane. In cases of shortening of the conjunctival surface, in which it has been reduced to ½ cm., I have taken a strip of mucous membrane from the lip measuring 4 m. in breadth at the centre. I generally cut out the strip from the angle of the lip, and from the line of demarcation, between the dry and moist surface of the lip. A couple of fine sutures which serve to unite the lips of the wound in the lip, arrest the bleeding at once, and accelerate the union of the part, which is generally completed in twenty-four hours.

I shall conclude by stating that I have taken special care to see patients who had been operated on by my method at intervals of several months after the operation, and I can affirm that there was in no case any tendency to a relapse. In some cases a whole year, and in others upwards of six months have elapsed without any disadvantage. Of the twenty-five cases operated upon by me at the Strangford Eye Infirmary in the course of last year, four had already been operated upon elsewhere, first after Snellen's method, and a second time after Arlt's operation. The conjunctival surface in these cases measured only 1 cm. in breadth. I have observed these patients for upwards of six months, and am persuaded that their cure is permanent and complete.

ABSTRACTS OF LECTURES ON THE INTRA-OCULAR MUSCLES OF MAMMALS AND BIRDS.

Delivered at the Royal College of Surgeons of England, February 21st, 1887.

By Walter H. Jessop, M.B., F.R.C.S.

(*Continued from page 164.*)

Lecture III.

The lecture was devoted to the consideration of the local action of drugs on the intra-ocular muscles of mammals. The drugs were divided into three classes, according to their physiological properties. The first group comprises atropine, homatropine, daturine, hyoscyamine, hyoscine, gelsemine, and scopoleine; the second consists only of cocaine; and the third includes eserine, pilocarpine, muscarine, and nicotine. The experiments were chiefly on a characteristic drug of each group, namely, atropine, cocaine, and eserine.

Atropine.—(A.) *On the Pupil.*—Atropine produces in mammals mydriasis, and the pupil becomes inactive to light and accommodation. If care be taken to apply the drug over a limited space the pupil dilates first at that part, and general dilatation occurs afterwards. It has no effect on the pupils of birds, and acts more feebly in rabbits than in most other mammals.

Czermak cut away the cornea of a dog, letting out the aqueous humour, and found on adding atropine that mydriasis occurred. Mydriasis follows the local application of atropine to an exsected eye, or the eye of an animal bled to death. On tapping the anterior chamber of an atropinised eye contraction of the pupil ensues; but in a rabbit bled to death, the right eye being atropinised before, and the right cervical splanchnics after death stimulated two or three times to empty the iris of blood, no contraction of the pupil ensues on tapping the anterior chamber.

Third and Myotic Nerves.—Atropine increases the mydriasis produced by section of the third nerve, ablation of the ciliary ganglion, or section of the short ciliary nerves. Stimulation of the third or short ciliary nerves has no effect on atropine mydriasis.

Cervical Splanchnics and Mydriatic Nerves.—The myosis due to section of the cervical splanchnics is overcome and mydriasis produced by atropine, even when the splanchnics have been cut for three months in a rabbit. Section of the cervical splanchnics slightly diminishes atropine mydriasis, but stimulation of these nerves increases the size of the atropinised pupil. Atropine dilates the pupil after excision of the superior cervical ganglion; and atropine mydriasis is usually increased by stimulating one or more of the long ciliary nerves, or by faradaising the periphery of the cornea.

Trigeminus. — Atropine mydriasis is diminished slightly on section of the trigeminus. Atropine produces dilatation of the pupil after section of the fifth nerve.

Direct Pupillary Stimulation.—On an ordinary atropine mydriasis direct faradaic stimulation of the pupil produces myosis, but if the muscle is completely under the influence of atropine such stimulation has no effect.

(B.) *On the Ciliary Muscle.*—Atropine produces relaxation of the muscle, and if used for some time complete paralysis.

The results of the above experiments show that atropine acts directly on the unstriped muscular fibre of the intra-ocular muscles by paralysing it; and this action is the same as on all unstriped muscle. On the pupils of birds atropine has no effect, owing to the muscular fibre being striped. This difference in the action of atropine on muscle is also well seen in experiments on the œsophagus of the cat, which in its upper three-fourths is composed of striped, and in the lower fourth unstriped, muscle; atropine only affects the lower fourth, producing after a time complete paralysis. The

weak atropine mydriasis observed in rabbits is due to the radial fibres present in them being paralysed, and so mechanically impeding the recoil of the pupillary muscle.

Section of the cervical splanchnics and the trigeminus prevents extreme atropine mydriasis by dilating the blood-vessels of the eye, and so producing turgescence of the iris, which thus prevents the dilatation of the pupillary muscle.

COCAINE.—(A.) *On the Pupil.*—Cocaine produces wide dilatation of the pupil, but the pupil still acts to light and accommodation ; partial mydriasis by limiting the area of its action, as in atropine, may be observed. Cocaine induces mydriasis in the exsected eye, and increases the dilatation of the pupil observed in animals bled to death. On tapping the anterior chamber of the cocainised eye there is, as a rule, no contraction of the pupil as is seen in the atropinised eye.

Third and Myotic Nerves.—The mydriasis produced by section of the third or short ciliary nerves is increased by adding cocaine. Stimulation of the third or short ciliary nerves induces myosis in the cocainised eye.

The full dilatation of the pupil under cocaine is not increased by section of the third nerve, but the pupil loses its action to light and accommodation.

Cervical Splanchnics and Mydriatic Nerves.—Section of the cervical splanchnics or the long ciliary nerves has no effect on full cocaine mydriasis. In cases of *ad-maximum* cocaine mydriasis stimulation of the cervical splanchnics has no effect, but in the ordinary mydriasis due to the drug, such stimulation increases the dilatation of the pupil. After section for some time of the cervical splanchnics, cocaine has no effect on the pupil.

Direct Pupillary Stimulation.—Cocaine mydriasis is easily overcome by direct faradaic stimulation of the pupil, and myosis results.

(B.) *On the Ciliary Muscle.* — Cocaine produces relaxation of the ciliary muscle, and paresis, or even complete paralysis of accommodation, but the effect does not last long.

Results.—Cocaine acts on the pupillary muscle by stimulating the endings of the cervical splanchnics in the mydriatic nerves; it is probable that it acts on the endings of the long ciliary nerves to the ciliary muscle, and so induces relaxation of the muscle.

ESERINE.—(A.) *On the Pupil.*—Eserine induces great contraction of the pupil in mammals, but the pupil always acts to light. In the eye of an animal bled to death eserine produces myosis.

Third and Myotic Nerves.—Eserine contracts the pupil after section of the third or short ciliary nerves. In complete eserine myosis faradaic stimulation of the third nerve does not increase the contraction of the pupil.

Cervical Splanchnics and Mydriatic Nerves.—If the eserine myosis is slight faradaic stimulation of the cervical splanchnics overcomes it, but if it is complete such stimulation has no effect. Eserine increases the contraction of the pupil due to section of the cervical splanchnics, even after the section has been made three months.

Trigeminus.—After section of the fifth nerve in front of the gasserian ganglion eserine induces the usual myosis.

(B.) *On the Ciliary Muscle.*—Eserine produces contraction of the ciliary muscle, giving rise to spasm of accommodation. In cases of palsy of the third nerve eserine induces contraction of the ciliary muscle.

Results.—Eserine acts on the intra-ocular muscles as on the unstriped muscle of other parts by stimulating directly the muscular fibre.

From the foregoing experiments the action of atropine is by paralysing directly the unstriped muscular

fibre; eserine by stimulating such fibre; and cocaine by stimulating the endings of nerves relaxing the muscles.

The next experiments are on the antagonism and combined actions of these three drugs on the pupillary muscle, and will be found to corroborate the actions given above.

ATROPINE AND ESERINE.—In ordinary atropine mydriasis, the addition of eserine reduces the dilatation of the pupil, but if the *ad-maximum* atropine mydriasis be induced eserine has no effect. The reason of this is that as long as the muscular fibre is not completely paralysed eserine can stimulate it, and produce myosis, but when complete palsy ensues eserine has no effect. If eserine and atropine be used together myosis ensues first, and is afterwards followed by dilatation of the pupil. Atropine always overcomes eserine myosis if used long enough.

ATROPINE AND COCAINE.—Cocaine mydriasis is not increased by atropine, but the pupil no longer acts to light and accommodation. Atropine mydriasis is usually increased by cocaine, but, in rare exceptions, where the *ad-maximum* atropine dilatation has been produced, the addition of cocaine has no effect.

COCAINE AND ESERINE.—Full eserine myosis is never overcome by cocaine. Eserine always reduces cocaine mydriasis. The mixture of cocaine and eserine (2 per cent. solution of each) in the proportion of twenty-six of cocaine to one of eserine produces no change in the pupil.

Of the mydriatics belonging to the same group as atropine, viz., homatropine, daturine, duboisine, hyoscyamine, hyoscine, gelsemine, and scopoleine, the physiological action is the same, and they differ simply in the intensity of their effects. The most important of them are homatropine and hyoscine.

HOMATROPINE is the most frequently used, and its action is quicker, weaker, and less lasting than atropine.

HYOSCINE is the strongest and quickest in its action, but though clinically very useful, it is dangerous in cases predisposing to glaucoma, as eserine has no effect on the mydriasis induced.

The other myotics, pilocarpine, nicotine, and muscarine act on the unstriped muscular fibre of the intraocular muscles as eserine by stimulating it, and thus inducing contraction.

PILOCARPINE is a much weaker drug than eserine, and the ratio of their respective strengths on the pupil may be estimated by their behaviour with cocaine, when eserine is found to be seven times stronger than pilocarpine. Pilocarpine has no effect on the atropinised pupil.

MUSCARINE acts more energetically on the ciliary muscle than on the pupillary.

A. SCHIELE (Berne). **On Co-excitation in the Regions of Homonymous Visual Fields.** *Archives of Ophthalmology, Vol. XVI., p.* 317.

Schiele records a series of observations which are of great interest, and which, if they may be accepted as precise, exhibit a hitherto unknown interdependence of the visual fields, and justify certain important inferences concerning the nature of the contracted field of neurasthenia, and the fusion of the two fields in the brain.

The class of cases investigated comprises those which have been described as retinal anaesthesia or hyperaesthesia, hysterical contraction of the field, neurasthenic amblyopia, reflex amblyopia, etc., the common characteristic of which is a variable and unusually concentric contraction of the field, which is aggravated by fatigue of the visual function. In all the cases in which the concentric limitation of the field existed, it depended on a pure disturbance of the cerebral functions, or on a disturbance complicated with an organic lesion; and in all cases a further limitation could be produced by continued examination. In a number of healthy persons, examined in the same way for the sake of comparison, the limits of the field did not change.

Observing that when he examined both eyes in succession the second eye always showed a greater contraction of the field than the first, Schiele conceived that excitation of the one eye must cause contraction of the field not only of this eye but of the fellow also. He, therefore, investigated the influence of fatigue of one eye on the field of the other. The results, as given in the abridged translation before us, are not very easy to understand, especially as the precise method of experiment is not described, but they would appear to be as follows:—

In certain cases, one eye being fatigued by several successive examinations with the perimeter, its visual field contracts regularly in each successive examination by an equal amount (2 degrees), *i.e.*, it contracts in arithmetical, not geometrical progression. Meanwhile, the field of the other eye contracts in exactly the same manner.

Fatigue of one half only of the visual field of one eye (the precise method is not stated) causes contraction of this half, while the adjacent half remains unaffected. Meanwhile, in the fellow eye, a corresponding contraction of the homonymous half only occurs.

In like manner it is possible to fatigue, and thereby contract a quadrant only of the field in one eye, and to produce a similar contraction in the corresponding quadrant of the other.

In other cases the effect produced in the fellow eye resembles less closely that produced in the fatigued eye. Thus, concentric contraction in one eye may induce contraction in only one half of the field of the other.

In other cases, again, while one half of the field contracts, the other half dilates in the same degree, and, meanwhile, similar changes occur in the corresponding half of the field of the other eye.

From these observations the author infers that the so-called fatigue is not a retinal symptom, but must be located in the occipital lobes, where homonymous parts of the two retinæ are represented in the same part of the cortex.

Having paid some attention to the perimetric examination of the visual field in cases of neurasthenia (*vide* O. R., Vol. III., p. 140, etc.), we venture to think that in some respects these very interesting observations must be received with reservation. In the first place, is it really possible to map the uncertain and shifting outline of the neurasthenic field with such precision as is represented in the figures illustrating this paper? For instance,

Figure 6 is a chart of ten successive journeys of the test object round the field, and shows ten nearly concentric outlines, each of which in turn represents a nearly uniform contraction of less than three degrees, on the average, in every semi-meridian (twelve in number). It is rarely, we think, that a patient suffering from neurasthenic amblyopia could indicate, one hundred and twenty times in succession, the limit of the field without once making an error of two or three degrees. We would suggest, in passing, that a continuously contracting field is not correctly represented by a line which returns to the starting point at the completion of the journey round the field ; a spiral line (*vide* O. R. *loc. cit.*) represents more correctly the constantly increasing contraction in relation to the order and moment of time in which each successive meridian is examined.

Interest chiefly attaches, however, to the very important observation that excitation of any portion of *one retina* exhausts the visual function in the corresponding homonymous portions of *both fields*. If this is definitely established it strongly supports the view that the exhaustion of the visual function is central and not retinal ; moreover, it points to a closer organic relation of the central representations of the two retinæ than has yet been established. Without for a moment denying the accuracy of Dr. Schiele's research, we would point out that his results are apparently at variance with well-known phenomena in physiological optics. If so close a sympathy exists between the two fields in neurasthenia, we might expect to find some trace of it in health. It is easy, in health, by exposure of any given portion of one retina to strong excitation, to temporally depress function in this portion of the field. It is still easier, by exposing one retina, or any given part of it, to a particular colour, to exhaust this portion of the field for that colour. But we do not find any corresponding exhaustion to be produced thereby in the field of the other eye. Helmholtz, indeed, infers from a very close study of the so-called contest of the visual fields in relation to light and colour, that "the content of each visual field reaches our conciousness without blending, by any organic arrangement, with the content of the other field ; and that the blending of the two into one picture is a psychical act." (Handbuch d. Physiolog. Optik., 1867, p. 771.) Whatever may be the truth of the matter, Schiele's paper raises a most interesting question which calls for further study.

L. O. TINKELSTEIN (St. Petersburg). On Sensory Disorders in Diseases, and on Changes of the Fields of Vision in Menstruation. *Inaugural Dissertation, St. Petersburg, 1887, p. 232, with sixteen figures.*

We take the following abstract of this monograph from *The Provincial Medical Journal* for July 1st, 1887. It is especially interesting in connection with Dr. Schiele's paper noticed above.

The work is based on a large number of observations conducted by the author, under the guidance of Professor J. P. Mierzejewki (pronounced Merjëëvski; a Polish name), in the clinic for nervous and mental diseases in St. Petersburg. The clinical material consisted of sixty-two cases of epilepsy, fifty-six of hysteria, forty-four of neurasthenia, and forty of acute and chronic alcoholism. In every case the author examined (*a*) the fields of vision (by means of Forster's perimeter), visual acuity, refraction, ocular fundus; (*b*) hearing (by means of a watch, tuning-fork, and whisper) and bone-conduction (by means of a tuning-fork); (*c*) taste (by means of vinegar, salt, hydrochlorate of quinine, and sugar); and (*d*) smell (by means of assafœtida, &c.) The author has come to the following main conclusions :—

I. *Epilepsy* (Forty-one men and twenty-one women, aged from eleven to sixty-seven).—1. The fields of vision undergo a general concentric narrowing under the influence of the fits. 2. There are two varieties of the constriction: (*a*) a more or less regular or equal narrowing of both halves of visual field; and (*b*) a more or less hemianopic narrowing. [In fifty-three of sixty-two patients a regular contraction, in eight a hemianopic, and in one an irregular was present.] 3. All radii of the field are diminished, but the internal radius undergoes the greatest shortenings. 4. The constriction fully coincides in time of appearance with general premonitory symptoms of the fit (giddiness, headache, cardiac palpitation, &c.) 5. The greatest narrowing, however, is observed immediately after the fit. 6. The narrowing lasts for two or three days after the fit, and then (provided no further fits occur) gradually disappears to give place to the normal state of things. [The author never saw a permanent constriction of the field, even in the most severe cases.] 7. Stability of the narrowing is dependent solely upon intensity of the fit and duration of

the disease. 8. Constriction of the fields of colour-vision occurs invariably in all cases, and is still more pronounced than that for white colour. 9. The greatest diminution after the fit is manifested by the field for green, the least by that for blue, while those for yellow and red stand between. 10. In a majority of cases (in 61·3 per cent.) a perversion of colour-perception is also observed. The perversion of green (which colour is then seen yellow) occurs most often, the perception of yellow suffers less frequently; that of red and blue is perverted even more rarely. 11. After the fit, the fields of colour-vision gradually return to the normal, the blue field being first, the green last, to resume their normal extent. 12. The same holds true in regard to colour-perception. 13. After the fit there may be often observed, also, a falling out of one or other colour from the visual field, green falling out most often, yellow by far less frequently, and red very seldom. As a rule the internal radius mainly falls out. 14. The central vision grows more or less worse after the fit, to recover with the general improvement. 15. Paroxysms of *petit mal* seem to act on the functional activity of sense-organs identically with the convulsive epileptic fits. 16. There often occur after the fit scintillant scotoma and a rapid exhaustibility of the retina, which phenomena, however, soon disappear after the patient's general improvement. 17. The pupils after the fit are mostly (thirty-four of sixty-two cases) normal, but sometimes they are dilated (in eleven), or narrowed (in eighteen). 18. Hearing is usually (in forty-two of sixty-two) impaired after the fit; it may be weakened on both sides (in nineteen), or only on the left (fourteen), or on the right alone (nine). The bone-conduction is lowered as often. 19. Smell is also affected very often (in forty-one of sixty-two). It may be weakened on both sides (thirteen), or on one side (seventeen), or perverted (two), or totally destroyed (nine). 20. The same is true in regard to taste, which becomes either weakened (thirty-two), or perverted (twelve), or is destroyed altogether (two). 21. The patellar reflex is slightly increased immediately after the fit, but subsequently rapidly decreases to return to the standard only two or three days later. 22. The post-epileptic changes of the visual fields and perversion of colour perception may prove of use as a means for diagnosing a true epilepsy from a simulated one.

II. *Hysteria* (three men and fifty-three women, aged from fifteen to fifty-one).—1. The fields of vision undergo a (mostly regular) concentric narrowing. 2. The latter is the more considerable, the more severe the affection is. 3. The fields of colour-vision also present a concentric contraction which usually (in eighty-four per cent.) takes place without any change in their physiological relative extents. 4. The falling out of all fields of colour-vision is met only in most severe cases of hysteria, but that of one of the fields of vision is observed not uncommonly. The field for green falls out most often. 5. Perversions of colour-perception are very frequent and extremely varying, but they do not possess any feature characteristic of the affection. 6. Paracentral scotoma (for green alone, or for all colours), of a fairly mobile character, is met in hysteria not unfrequently. 7. A rapid exhaustibility of the retina in hysteric subjects is observed by far more commonly than in the epileptic. 8. The functional activity of other sense-organs in hysteria is always either impaired or destroyed, the greater functional disturbance being invariably found on the side of a greater contraction of the visual fields.

III. *Neurasthenia* (forty-one men and three women, aged from nineteen to thirty).—1. The fields of vision are invariably narrowed in a concentric manner, the constriction often (in twenty-five per cent.) having the outline of a transverse oval. 2. Sometimes the field for white is normal, while the fields of colour-vision are found to be very markedly shortened. This phenomenon is met only in neurasthenia, as far as functional neuroses are concerned. 3. Perversions of colour-perception are extremely varying and irregular. 4. The falling out of colours usually limited to green alone, and may be either total (four is cases) or partial (six), the phenomenon occurring mostly on one side. 5. The retina is still more rapidly exhaustible than in hysteria. 6. Hearing, smell, and taste, as a rule, are either impaired or destroyed. 7. Tendon reflexes are invariably increased, and that on both sides, the increase standing in a direct proportion with duration of the disease.

IV. *Alcoholism* (five acute cases and thirty-five chronic, all in men, aged from twenty-seven to fifty-three).—1. In acute intoxication no disorders of sense-organs are observed. 2. In chronic alcoholism a stable concentric diminution of the visual

fields is met almost invariably, the constriction being observed in delirium tremens. 3. Perversions of colour-perception (dyschromatopsia) may be found in fifty per cent. of chronic cases, the both-sided variety occurring more often than the one-sided. The perversion concerns mostly green (which is then seen yellow), then red. 4. In some cases, also, the falling-out (general or partial) of green may be discovered. 5. Hemianæsthesia is not uncommon (in six of forty). 6. Hearing, smell, and taste, are more or less impaired. Taste is often perverted. 7. The patellar reflex is usually increased in chronic alcoholism, and slightly lowered in acute intoxication.

Finkelstein studied also the functional activity of the eye during menstruation in twenty healthy women, aged from nineteen to thirty-three. From this group of observations the following deductions may be drawn:—1. During the menstrual period there takes place a concentric narrowing of the field of vision. 2. The phenomenon makes its appearance one, two, or three days before the beginning of the hæmorrhage, reaches its greatest intensity on the third or fourth day of menstruation, and then gradually disappears about the seventh or eighth day of the period. 3. The narrowing varies in degree in individual cases. In general, it is more pronounced in those women whose menstruation is associated with malaise, headache, cardiac palpitation, and other nervous symptoms, as well as in those who lose large quantities of blood. 4. Not only the field of vision for white, but also the visual fields for green, red, yellow, and blue, undergo a regular diminution. 5. Perversion of perception of green (which is then seen yellow) is observed fairly often (in twenty per cent.), the phenomenon disappearing simultaneously with the contraction of the fields. 6. The central vision becomes impaired but slightly, to rapidly return to the standard after catamenia. 7. Refraction remains intact.

Muller-Lyer (Dresden). On Ophthalmic Migraine. *Berl. Klin. Wochenschr., No. 42, October 17th,* 1887.

Suckling (Birmingham). Migraine Attacks followed by Temporary Paralysis of the Third Nerve. *Brain, July,* 1887, *p.* 214.

Migraine is a disease possessing a painful personal interest for a large number of brain workers, and perhaps as a

consequence few of what may be termed the minor diseases have received so much attention. Its paroxysmalness and its gloomily suggestive relationship with epilepsy would of itself give it interest, but it possesses special interest for the ophthalmic surgeon in the fact that many attacks are accompanied by marked ocular symptoms. So much is this the case, that some years ago Charcot described as ophthalmic migraine those attacks characterised by the "fortification spectra," the "flickering scotomata," and the hemianopia, which have been frequently described. We have said above that migraine is to be classed among the minor ills that flesh is heir to, this chiefly because it does not in the great majority of instances seriously interfere with the enjoyment or the work of life, and also because it may return again and again with frequency, and yet leave no permanent evil result. In this last respect it differs essentially from the slighter grades of epilepsy, which result in mental deterioration with even greater frequency than the more severe forms. But although it is thus in general a minor and a purely temporary affection, such cases as are recorded in the above papers show that it is by no means always so.

Dr. Müller-Lyer records two cases of ophthalmic migraine. The first, a man, aged 52, accustomed to work in an overheated photographer's laboratory, had always been healthy till October, 1883, when he began to be troubled with occasional attacks of giddiness. To this was soon added cardiac palpitation, præcordial pain and anxiety, with throbbing in the left temple and severe headache, chiefly left-sided, also tinnitus, and the ocular symptoms above mentioned, including hemianopia. The attacks lasted for half an hour to an hour, and in 1886 occurred almost daily, and of such severity that the patient became emaciated, sleepless and melancholic, and gave up his situation.

At this time he came under Dr. Müller-Lyer's care, who found that, in addition to the above symptoms, he had also weakness of the right hand. He was put on gradually increasing doses of the bromine salts of potassium, sodium, and ammonium, amounting ultimately to seventy-five and ninety grains daily. From the commencement of the treatment he

began to improve, and speedily resumed his occupation. For some unexplained reason his recovery was interrupted by two attacks of temporary aphasia, but with this exception he improved steadily in general health and nutrition, and after two months was quite free from headache. The weakness of the right hand, however, persisted.

The author records another and slighter case of the same nature, and points out the resemblance that these cases have to epilepsy, adopting more or less explicitly Dr. Hughlings Jackson's belief that these are instances of discharging lesion involving the sensory area.

Dr. Suckling's case was that of a youth, aged 18, whose attacks of migraine began in infancy, lasted two days, and were limited to the left frontal region. He had no ocular spectra, but had a disagreeable taste in his mouth and a tender scalp after the attack. He had salivation during the attack and felt very cold. The left eyelid drooped after an attack in childhood, and this occurred frequently afterwards. Three years ago, after a severe attack, the left eye was completely closed, and the eyeball turned outward. The drooping of the eyelid and outward deviation of the eyeball occurred only after severe attacks, and required from one to seven days to recover. The oculo-motor paralysis is complete, involving both internal and external muscles. Dr. Suckling refers to Dr. Saundby's case (Lancet, 10th January, 1885), and we would also refer to Mr. Snell's case (Ophthalmic Review, 1885, p. 181), and to a paper by von Schrœder (Ophthalmic Review, 1885, p. 42) on the permanent consequences of ophthalmic migraine. Dr. Suckling found guarana in thirty-grain doses give relief in the above-recorded case, the paralysis never occurring under its use.

The exciting cause of migrane is evidently different in different cases, and as a result of this we have many remedies proposed. Each case must be studied by itself, and, after all said and done, resignation will frequently be the most suitable frame of mind for the sufferer.

OPPENHEIM (Berlin). **Hemianopia Bitemporalis Fugax as Diagnostic of Basal Cerebral Syphilis.** *Berlin, Klin. Wochenschr., No. 36, 5th September*, 1887.

In reading his paper before the Society of Charité Physicians, on 30th June of this year, Oppenheim also showed a male patient, aged 31, who had been admitted into the nerve clinic in May, suffering from severe headache since February, with periodical exacerbations and occasional vomiting, also complaining of transitory diplopia, loss of vision, especially in the left eye, and great thirst.

The patient had had a chancre in 1873, with glandular swelling, but no other secondary symptoms. On examination he was found to be suffering from incomplete bitemporal hemianopia, the defect in the left involving almost all the temporal half of the field and extending up to the fixation point, while that in the right, although extensive, was more peripheral. The visual defect along with diabetes insipidus were the only objective symptoms.

Oppenheim refers to a case already published by him (Virchow's Archiv., Band 104, 1886) of bitemporal hemianopia, with diabetes insipidus, in which *post mortem* a gummatous growth was found involving the chiasma, and in which the hemianopia had been very variable. Microscopically the new growth was specially rich in blood vessels, whose walls were much altered, and whose lumen was, in many instances, narrowed or obliterated by swelling of the intima and thrombosis. The new growth formed, therefore, a distensible tissue lying between the chiasma and the base of the skull, sending processes also among the nerve fibres. The charts of this case, taken at frequent intervals, Oppenheim now records, and they certainly show very considerable variations within the six weeks of observation.

The close resemblance of the two cases led to the free exhibition of potass. iodid., with the result that in six days the visual defect had almost disappeared. The charts are recorded. Also the headache and polyuria lessened from day to day, so that in a fortnight the patient could be discharged cured, with normal visual fields. Oppenheim mentions similar cases that have come under his notice, and he considers that the use of the perimeter is important as strengthening the diagnosis of basal cerebral syphilis.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, OCTOBER 20TH, 1887.

E. NETTLESHIP, F.R.C.S. Eng., Vice-President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

Hereditary Optic Atrophy.—Dr. S. H. Habershon.—After briefly referring to cases of hereditary amblyopia reported in the pre-ophthalmoscopic period, the author gave a short summary of Leber's description of the disease founded upon the cases of fifty-five individuals in fourteen families. The disease is confined almost exclusively to the male members of the family, appearing commonly at or about the age of puberty. It consists of a central amblyopia, coming on usually with suddenness and simultaneously, or nearly so, in the two eyes. The failure of sight progresses up to a certain point, a few months or so after the attack commences, and there remains stationary, without improvement and without manifest deterioration. The fields of vision are never contracted at the periphery, but present in most cases a central scotoma, more or less absolute. Colour sense is abolished or much diminished. There are no other symptoms of any importance. Headache frequently accompanies the attack, but is never severe. Occasional functional disorders of the nervous system are present, and subjective light and colour phenomena are seen. Sight is never completely lost, and rarely improved by treatment. The ophthalmoscope reveals at an early period a partial papillitis, while later there is pallor and incomplete atrophy of the disc.

Some more recent cases, including one of his own and six of Mr. Nettleship's, added seventy-five individuals to the original number of Leber. Statistics gathered from them showed that the disease is roughly grouped about two periods of life, puberty and that of the decline of the sexual functions. The great majority occur at the age of puberty, for of sixty-five in whom the age of onset was known, nearly fifty occurred between the ages of 13 and 23 inclusive. In answer to the question "What other diseases of the optic nervous system

bear the stamp of heredity?" the author compared the group of retinitis pigmentosa and allied affections with Leber's disease, and decided that consanguinity had very little to do with the disease under discussion. All hereditary diseases represented in the histories of the patients or their families were then mentioned, and the question of how far they were prone to produce amblyopia was entered into. Amongst the diseases discussed as to their connection with optic atrophy were hereditary syphilis, epilepsy, insanity, and spinal diseases, while a special reference to hereditary ataxy was made.

Collecting the evidence, he concluded that the hereditary nature of the affection depended on the transmission of a neurotic diathesis (the neuropathic type in which Leber classed the individuals), which left the patients specially prone to any exciting influence liable to affect the optic nerve. Exciting causes were looked for which had a depressing influence upon the nervous system in general. The influence of the sexual system was first discussed, and the liability to nervous disorders at the two periods of life represented by the disease was regarded as extremely significant. These influences were more potent in young men than in women, but he had been unable to find any case in which a disorder of vision could be attributed to sexual influences alone, because in most of the cases other common exciting causes (for example, tobacco) were present. The question of tobacco as an exciting cause was discussed at length. In nearly all the families now added to the previous literature of the subject, one or two of the individuals were smokers. The cases, if isolated and treated as cases of tobacco amblyopia (which they strongly resembled), would be regarded as instances of a bad or stationary type. Very similar cases existed, though rare, among juvenile smokers. Mr. Hutchinson had expressed the opinion that tobacco caused blindness owing to an idiosyncrasy which might be found in several members of a family. He would go further than this, for though when a depressing influence upon the nervous system was present, tobacco might act as the exciting cause, and induce the well-known form of amblyopia, still something more was needed to explain these non-retrogressive cases. He therefore considered that the evidence pointed to some peculiar inherited predisposition to pathological

disturbances of the nervous system, the precise part of the nervous system (the optic nerve) being determined by the kind of exciting influence.

Specimens.—The following living specimens were shown :—Mr. R. Marcus Gunn: Peculiar dotted appearance of the retinæ, with retinal asthenopia—a case illustrating the morbid condition described by Mr. Gunn in the third volume of the "Ophthalmological Transactions." Mr. H. Juler: A case of (?) retrobulbar neuritis occurring in a young woman who had suffered from rheumatism. The blindness came on suddenly on October 1st, and rapidly became worse, but was now passing away. Mr. Nettleship: Retinitis in diabetes and persistent hyaloid artery. Mr. Marcus Gunn: Chronic abscess of cornea. Mr. Doyne: Hæmorrhage into yellow spot region. Mr. W. J. Collins: Central detachment of retina in albuminuric retinitis.

Thursday, November 10th, 1887.

J. W. Hulke, F.R.S., President, in the Chair.

Reported by John Abercrombie, M.D.

Brain Disease with Hemianopia.—Dr. Seymour Sharkey. Paper on a case of cortical and subcortical disease of occipito-angular region producing hemianopia. The patient, a hawker, aged 29, had suffered for twenty years from ordinary epilepsy, and since from epileptic insanity. In October, 1886, he was struck on vertex of skull; the wound left a scar, and since that time he had not been able to use his right hand; the right leg was weak; the right hand said to have been rigid since, and to have gradually lost sensation. December 17th he had a fit, and was brought into St. Thomas's Hospital. Pupils dilated and unequal, the right bein the larger; clonic spasms of facial muscles, and rigidity of right arm and leg. He recollected the events of the fit, and had not bitten his tongue. Hemianæsthesia in the right side, including special senses. Optic neuritis developed. December 11th, right lateral hemianopia. Death, February 1st, 1887, preceded by headache, insomnia, and mental dulness, passing into coma. Temperature, previously normal,

rose on three last days before death, and ultimately reached 107·4° F. A tumour, a round-celled sarcoma, was found in the left cerebral hemisphere beneath the cortex, occupying the occipital lobe and part of the parietal lobe. Convolutions of anterior half of occipital lobe, superior parietal lobule, and upper extremity of angular gyrus, thinned. Posterior part of internal capsule not invaded, but the growth extended nearly up to this sensory crossway. Dr. Sharkey was not certain as to the cause of the partial right hemiplegia, but considered that the growth might have damaged without invading the arm centres. It had involved part of the leg-centres in the superior parietal lobule. The optic neuritis was ascribed to the chronic thickening of the meninges at the base of the brain. The homonymous hemianopia was ascribed to the destruction of the cortical and sub-cortical region of the occipito-angular region. The extensive destruction was parallel with the experimental facts determined by Ferrier, who observed that the lesion must be extensive and complete to produce a permanent ocular defect. The concentric contraction of the visual fields was probably due to the optic neuritis. The hemianæsthesia was set down to the damage to the fibres which go to make up the sensory crossway, but which had not yet entered the posterior third of the posterior limb of the internal capsules. Therefore the hemianæsthesia and the hemianopia might be ascribed to damage of the sensory radiations into the temporo-sphenoidal and callosal regions, and the optic radiations of the occipito-angular region. Dr. Sharkey also read the sequel to the case of hemianopia recorded by him in the fourth volume of the Transactions of the Society, page 276. The patient had had a series of epileptic fits associated with visual phenomena, and almost certainly due to discharges commencing in the motor cortex and spreading thence into the visual area or occipito-angular region. In December, 1886, all signs of paralysis had disappeared, but the area of blindness remained practically the same as before (Nettleship). This case was like other cases of hemianopia that Dr. Sharkey had seen, in that the symptom persisted for a long time without change, and without being associated with other morbid nervous phenomena.

Mr. Nettleship could call to mind at least four cases of hemianopia which remained stationary for three or four years.

In the case of one man the hemianopia had lasted at least ten years, and there was, perhaps, a peculiar intellectual state, for the patient invariably denied having been seen previously.

Mr. Keall had not observed special mental defects in cases of hemianopia.

Dr. J. Anderson thought that some cases were accompanied by mental change and others were not; perhaps hemianopia of cortical or subcortical origin was more likely to be accompanied by mental alterations.

Mr. Nettleship referred to cases of hemianopia of sudden onset, and apparently due to basal lesions, and asked how such cases were to be explained.

Dr. Sharkey, in reply, said that in the case of which he had read a sequel, the conclusion might legitimately be drawn that the hemianopia was of cortical origin. He had not observed alterations in the veracity of hemianopic patients. If the hemianopia were due to a basal lesion, the other sensory fibres lay so close to those which subserved vision that they could hardly escape; nevertheless, affection of the spinal and other senses might be overlooked, and, later in the case, compensation might have been established.

Iridectomy in Relapsing Iritis.—Mr. Nettleship. A paper raising the question: In what cases of relapsing iritis is iridectomy likely to prevent relapse? Relapses of iritis were due less to the presence of adhesions than to the constitutional cause of the disease, since syphilitic iritis did not relapse, whilst forms of rheumatic inflammation of the eye without iritis relapsed in exactly the same way as rheumatic iritis. He put aside as usually unsuitable for iridectomy, cases with keratitis punctata, and cases where the iris was very extensively adherent and yet softened (parenchymatous iritis), and regarded as unfavourable cases which were complicated with high myopia. On the other hand, he assumed the necessity of the operation in cases where iritis with circular synechia had led to bulging of the iris. He believed that whilst the effect of iridectomy in preventing future attacks of iritis had, chiefly owing to von Graefe's teaching, been considerably overrated, the operation, in properly selected cases, very seldom did harm, and sometimes undoubtedly did good. Observation of cases not operated on showed, however, that very long intervals occurred between

successive attacks, and that the disease tended to wear itself out with time, whilst, on the other hand, it was not uncommon to meet with cases which had relapsed as much after iridectomy as before. Taking into account these and other sources of error, the conclusion was arrived at that iridectomy for recurrent iritis should be resorted to only after a very patient trial of all other means of treatment. Cases were given in illustration of all the more important statements.

Mr. Priestley Smith doubted whether iridectomy was so effectual in preventing relapses as von Graefe's dictum would lead us to suppose. If occlusion of the pupil seemed near at hand it should, of course, be performed; otherwise, the main thing was to treat the constitutional cause. Among other measures, Droitwich salt baths, or some equivalent mode of stimulating the action of the skin, were very useful in these cases.

In reply to Mr. Juler, Mr. Nettleship said that in cases of serous iritis with keratitis punctata he thought iridectomy was not required; and in other cases when the iris was infiltrated, the iridectomy was not likely to prove of benefit. In cases of complete adhesion forming a circular synechia, iridectomy was called for and was generally beneficial. But he could not say which cases of relapsing iritis would and which would not be benefited by iridectomy.

Quiet Iritis.—Mr. J. Hutchinson, jun., related several cases in which the attack, sometimes leading to extensive adhesions, and involving much deterioration of sight, was from the first unaccompanied by the typical features of inflammation. Iritis, in certain cases, did not reveal its presence by the characteristic frontal pain, and was practically unattended by congestion or photophobia. He had tabulated thirty-seven examples of quiet or insidious iritis, and from these deduced the following conclusions: 1. Sympathetic inflammation, congenital syphilis, and inherited arthritic (gouty or rheumatic) tendency are probably the most frequent causes of quiet iritis. 2. This form is very rare in the iritis of acquired syphilis, that of the ordinary rheumatic type, and in traumatic or herpetic iritis. 3. Sex and age have little or no influence in modifying the severity of the symptoms accompanying iritis. 4. A constitutional tendency cannot always be invoked as the reasons for iritis taking on an

insidious form, as shown by the occasional occurrence of two attacks in the same patient, one being accompanied by violent inflammatory symptoms, the other perfectly quiet throughout. 5. The absence of the ordinary symptoms of iritis by no means always implies a mild course of the disease, some of the cases going on to complete blindness of the affected eye.

Mr. J. B. Lawford said that it would be difficult to tell whether the quiet iritis were relapsin or not if the pigmentation on the lens were the chief evidence of past mischief; cases might originate congenitally, or even during intrauterine life.

Mr. Hutchinson, in reply, thought that the cases might originate during intrauterine existence; in one case a traumatism was the cause, but the iritis was altogether quiet, and only discovered after the use of atropine, by the presence of uveal pigment on the lens.

Living and Card Specimens. Mr. Quarry Silcock: Case of Choroido-retinitis, with Opaque Nerve Fibres and Keratitis Punctata.—Dr. Poulet Wells: Localised Secondary Pigmentation of Retina in Distribution of Plugged Branch of Central Artery.—Mr. Keall: (1) A Case of Congenital Small Lens (?). Mr. Juler considered that the lens was present of usual size, and on its posterior surface there was an opacity. (2) Semicircular Hæmorrhage not at the Macula Lutea.—Mr. Doyne: Recurrent Œdema of Upper Eyelids, in a Young Woman who had not Menstruated; it had lasted fourteen months; megrimous headache had appeared for the last two months.—Dr. Mules: (1) An Evisceration Scoop: and (2) an Instrument for Inserting the Artificial Globe used in his method of operation. (Made by Mr. Armstrong, of Manchester, price 7s. 6d.)—Mr. Juler: A New Apparatus for Illuminating the Perimeter.—A Manuscript Copy of the Library Catalogue, prepared by Mr. Adams Frost, was laid on the table.

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IVORY EXOSTOSIS OF ORBIT REMOVED BY DRILLING.*

By Karl Grossmann, M.D.,

Ophthalmic Surgeon to the Stanley Hospital, Liverpool.

The case I am about to describe has been under my notice for some time. The large size of the tumour, the unusual mode of operating, and the good result—now lasting for fully a year—will justify its publication. I here give the description of the case :—

The patient, a young man of 24 years of age, came to me for the first time in October, 1884. Protruding below the inner half of the right eyebrow there was a large, roundish tumour, very hard, immoveable, filling completely the upper and inner half of the orbital margin. The right eye was pushed outwards and downwards on to the right zygoma. The movements of the eye were free, but impaired in all directions; the lids closed with difficulty only. The conjunctiva was hyperæmic, the optic disc of a reddish colour, and the retinal veins dilated. $V = \frac{10}{20}$.

The left eye was quite normal, but in the inner side of the left orbit a small, hard prominence, about the size of a cherry stone, was distinctly to be felt. $V = 1$.

As for the history of the case, the patient could give no information at all, except the vague statement that the growth had come on very gradually for nearly ten years. Neither strong blows nor falls had taken place. Syphilis could almost certainly be excluded; still, before attacking the tumour directly, I tried anti-syphilitic remedies for two months, but with no visible result. The question as to whether an operation should then be undertaken or not was disposed of by the fact that the patient suddenly stopped away and did not return for two years.

In September, 1886, he came back. On the right side, the tumour, greatly increased, filled the orbit almost completely. The protruded eyeball had prevented the patient from closing the lids for a long time, and had undergone disastrous changes; sloughing of the cornea, suppuration, and complete destruction of vision.

* The patient was shown at the Liverpool Medical Institution, Dec. 9th, 1886.

The small exostosis in the left orbit had grown, too, the eyeball being pushed downwards and outwards, and protruding at the same time. Sight was slightly impaired, $V = \frac{15}{20}$, but no other abnormal symptoms were present.

The right sloughing eyeball was removed at once, and the wound healed quickly; but now the question arose what to do for the left eye.

As to the nature of the complaint, there was no doubt at all that we had to deal with one of the hardest ivory exostoses possible. -- An exploratory puncture with a fine steel drill, applied to the right tumour, proved this point at once. Furthermore, the growth was double-sided, and evidently involved the frontal sinus; perhaps it was protruding into the brain. Unfavourable as the prognosis is for the removal of exostoses from the upper wall of the orbit, it becomes worse when the tumour is double-sided, about 25 % being considered the mortality. The difficulty was increased by the fact that the growth in the upper inner corner of the left orbit was rather flat, with a broad, wide base, and that a second exostosis seemed likely to exist deeper in the orbit, to judge from the protrusion of the eyeball.

The patient was willing, in fact begged, to have anything done which could save the eye he had left.

Under the circumstances, chiselling would have been extremely dangerous, and, as the adamantine compactness of the bone proved afterwards, almost impossible. I therefore resolved to drill long holes through the whole base of the tumour close together, and to sever the septa between them by drills which cut sideways. For this purpose I had special drills made to fit the dentist's "burring" engine; those for boring the holes were about $\frac{1}{10}$ inch (2·5 mm.) in diameter; those cutting sideways $\frac{1}{16}$ inch (1·5 mm.); and they were long enough to drill holes over an inch-and-a-quarter deep.

The operation was performed on October 29th, 1886. The section through the skin and the periosteum being made in the usual manner, the drilling began. After some forty minutes' tedious work, an intensely hard, flat exostosis, in shape not unlike half a plum, could be taken off, when a second tumour, flatter still, was found behind the first, and was also removed.

The operation was tiring, I must confess. It extended over two hours and a half, and the patient had a large quantity of chloroform. The wound was closed in the usual way, and a small drain left in it. The patient, although vomiting for twenty-four hours, showed no other abnormal symptoms whatever. He left the hospital on the twelfth day.

When I showed the patient at the Medical Institution on December 9th, 1886, the drain was not yet removed, but there was very little discharge. The eye had then resumed very nearly its normal position, and the vision was re-established to $V = 1$.

After having lost sight of him for some time, I saw him again yesterday (November 6th, 1887). There is no change in the condition of the left eye. The tumour seems to have stopped growing, and the sight is full, normal vision, both for far and near objects. The right exostosis shows a very small increase in size, but as there is no pain, and the patient feels quite well and is able to work, it will remain a "*noli me tangere*," at least for the present.

I do not mean to place this mode of operating before chiselling altogether. Cases, however, will present themselves where it will be preferable to adopt it, especially where the exostosis is flat and extremely hard, where the room for chiselling is very small, and where a slip of the chisel might be dangerous, as in the depth of the orbit. The danger of violently rupturing the roof of the orbit, with its gloomy prospect of meningitis, is completely avoided, as the drill can be used as lightly as a pencil. It is true it is a tedious, slow work, as compared with the chisel. The treadle has to be worked by one foot in a constrained position, and, unless the operator has much practice with the machine, he will feel very much fatigued for a day or so after two to three hours' drilling. On the other hand, the treadle is more reliable than electricity, or any other mechanical means. The drill, especially when beyond a certain depth, is likely to stick fast; and when the machine is worked by the foot of the operator, it can be stopped immediately, the instrument being easily controlled.

J. A. Andrews (New York). Successful Removal of Two Osteomata of the Orbit: One originating in the Frontal, the other in the Ethmoidal Cells. With a History of Osteomata of the neighbouring Pneumatic Cavities of the Orbit. *Medical Record, September 3rd, 1887, p. 261.*

In connection with the subject of Dr. Grossmann's communication in the present number of the O. R., we would call attention to the recent valuable study of orbital osteomata by Dr. Andrews. For the account of his own two successful cases, and for an admirable abstract of previously recorded cases we must refer to the original article. The following summary of the facts collated we reprint almost as it stands :—

It was formerly customary to designate every bony formation in the orbit which showed itself above the plane of the bone an *exostosis*. Cruveilhier was the first observer to direct attention to the differences between the bony tumours of the orbit. He showed that these growths developed in the interior of the bone in such a manner as to push the peripheric layer of bone before them like a capsule; he therefore called them "*encapsuled* bony growths." Virchow showed that orbital osteomata in general may develop in various ways; a great number of them, he believed, originated in the diploë, and in their further development distended the shell of bone enclosing them, which they gradually broke through. These tumours Virchow called *enostoses*, thus separating this form of osteoma from the class of exostoses.

The collated cases of *osteoma of the frontal sinuses* show that the growth is usually first noticed about the period of puberty; *i.e.*, the time when these cavities, which are absent at birth, develop with the greatest energy. But certain cases show that osteomata may exceptionally form in fully developed frontal sinuses.

In consequence of abnormal development in the segment of the frontal bone bordering on the ethmoid, Arnold states, remnants of cartilage may be the starting point of the new formation, which is first seen as an enchondroma, and later is changed into an osteoma by total ossification.

Pathological Anatomy.—Osteomata of the *frontal sinuses* are, as a rule, hard like ivory, and irregular in form, with

a partly nodular or mammillated surface, sending out conical processes, with which they fasten themselves in the different cavities into which they grow; a fact of great importance to remember in connection with the operation for their removal. Shallow furrows and holes are frequently found in the surface for the reception of blood-vessels and invaginations of the periosteum; or, as noted in two of the cases cited, the grooves in the surface have resulted from the tumour having, while growing, met with resistance from normal osseous projections, ledges, tendons, &c.

The external osteomata of the frontal sinuses seem to be essentially influenced by the resisting bodies against which they impinge in growing; and as these are pretty much the same in all cases, it is not curious that these tumours should bear a striking resemblance to one another. We generally find the *largest portion* of the growth in the *frontal sinus*, and a small projection from it in the orbit.

On close inspection, it will be seen that the osteomata of the frontal sinuses consist of two different substances—a thick, ivory-like shell, which generally preponderates, and a spongy portion; the consistence of the former exceeding, in point of hardness, normal compact bone. The spongy portion consists of a system of delicate bony plates, with soft, vascularised tissue between them. When the tumour is cut open, its cut surface displays concentric and radial lines in the ivory substance. The tumour adheres to the frontal bone either by a small pedicle or a broad base of spongy bone.

Dolbeau maintained, on the basis of pathologico-anatomical investigations and on observations, that the osteomata (exostoses) of the frontal sinus always sprang from the mucous membrane and never from the osseous substance of the wall of the frontal sinus, and that, consequently, by a free opening of the frontal sinus they might be extirpated, just as a stone is removed from the bladder in lithotomy. This statement is certainly incorrect.

The consistence of these growths differs according to preponderance of the spongy or the ivory substance. Generally the ivory-like shell preponderates, and there may be only a trace of spongy bone; in rare cases the tumour may consist chiefly of a spongy mass, on which ivory bone plates are

scattered, making the entire growth softer than normal bone. In the majority of the cases carefully observed, the entire surface was covered with a delicate connective-tissue envelope ; in some instances, parts of this envelope were the seat of polypous excrescences, which sprang out of remains of mucous membrane which had atrophied under the pressure to which it had been subjected by the tumour.

Osteomata of the frontal sinuses not alone distend, but perforate, the walls of the sinuses ; but they do not show a tendency to coalesce with the walls of bone which they pierce—a fact of great practical importance in connection with the operation for their removal.

The *perforations* take place, most frequently, *outward* through the anterior plate of the frontal bone, and through the roof of the orbit into the orbital cavity. They rarely project into the nasal cavity. The os planum of the ethmoid bone and the lachrymal bone are destroyed in exceptional cases, where the tumour has such a broad base projecting into the ethmoidal cells that the point of origin of the tumour cannot be made out. Perforation through the inner plate of the frontal bone into the cranial cavity is not uncommon, and this may take place, as is shown by Arnold's case, at an early period, when the tumour was not quite as large as a walnut. The cases recorded show that osteomata of the frontal sinuses may be *unilateral* or *bilateral ;* but, in the latter case, there may be only one tumour, perforation taking place through the septum, and this seems to be the more common. Then there may be several partly pedicate osteomata in one sinus. But that all osteomata do not, as Arnold asserts, originate in the posterior wall of the frontal sinus, is shown by the cases of Banga, Jobert, and Demarquay, in which the growth was implanted into the anterior plate of the frontal bone.

Osteomata of the Ethmoidal Cells are, as a rule, spherical in shape, with an irregular nodular surface of the same anatomical structure as the osteomata of the frontal sinuses.

Antrum of Highmore.—The histological relations in the maxillary cavity are analogous to those in the frontal sinuses, and all the hypotheses relating to the development of these tumours can be applied to tumours of the antrum of Highmore.

Arnold's embryological investigations might here likewise come into consideration, since also in this locality preformed cartilaginous parts of the primordial skeleton are found.

Osteomata of the Antrum develop in one of the walls of this cavity, and they are generally encapsuled. These tumours also show a tendency to become spontaneously detached by suppuration, a peculiarity which seems to be common to encapsuled osteomata. From the few carefully observed cases of osteomata of the antrum, it appears that they spring from the medial wall, and show a tendency to grow laterally. They are covered with mucous membrane.

Osteomata of the Sphenoidal Sinus, as a rule, first extend into the cranial cavity.

All orbital osteomata, external or encapsuled, show the same structure; *i.e.*, they are composed of an ivory-like portion and a spongy portion; and it seems probable that they all spring directly from the periosteum, and as they grow, the spongy portion is formed by resorption of the ivory mass.

Symptoms.—All orbital osteomata grow very slowly, and, when uncomplicated, are generally painless and without inflammatory symptoms.

Frontal Sinus.—In osteoma of the frontal sinus, the patient's attention is first attracted to his disease by the presence of a tumour at the *upper inner angle* of the *orbit*. When the disease is *bilateral*, the prominence takes place in the *middle of the forehead*, directly above the *root of the nose*. Sometimes a collection of pus and mucus in the frontal sinuses complicates these tumours. But the formation of polypi and suppuration in the frontal sinuses, which sometimes complicate these tumours, does not, as has been supposed, give rise to the development of the osteoma; but these conditions are, on the contrary, the result of the presence of the tumour, which, by closing the channel leading to the nasal cavity, gives rise to retention of mucus in the frontal sinuses, and also the mechanical irritation to which the mucous membrane is subjected during the growth of the tumour. An acute suppurative process may be set up in the cavity, and perforation take place through the walls of the sinus; the external plate of the frontal bone being, by preference, the seat of perforation, the pus then making its way, generally, at the inner angle of the orbit, or, as has been

observed in an exceptional case, at the upper outer angle, and leading in either case to a fistula in the bone. The *eye is displaced forward and downward* and a *little outward*. On account of the slow growth of these tumours, *vision* may long remain unimpaired. Conjunctivitis, ciliary neurosis, disturbance of circulation and inflammatory changes in the retina, and ulceration of the cornea, may result from mechanical disturbance of the eyeball; but they grow so slowly that the eye tolerates their presence for a long time, without having its vision materially disturbed thereby. The *inner plate* of the *frontal bone* may be perforated by the tumour, and the latter attain to considerable dimensions without giving rise to any brain-symptoms. Osteomata of the frontal sinus have, after projecting into the ethmoidal cells, extended to the lamina cribrosa, and through it into the cranial cavity, in which case the osteoma appears to arise from the ethmoidal sinus. But it is more common for tumours in this region to perforate the inner wall of the sinus and invade the cranial cavity.

Ethmoidal Sinuses.—Osteomata of the ethmoidal sinuses are, as a rule, first observed as a hard tumour at the *inner angle of the orbit*, increasing in its growth from within outward, whereby the eyeball is displaced laterally; the upper margin of the orbit is also sometimes forced upward, and the lower margin downward. But this takes place only in those cases in which the orbital portion of the growth has been very large.

Osteomata of the ethmoidal sinuses may intrude into the nasal cavity. Vision may be normal or greatly impaired. Choked disc has been observed in such cases, and ulceration of the cornea may result where the exophthalmos is so pronounced as to interfere with the closing of the eyelids.

External Exostoses.—In the eleven cases of *external exostosis* cited, traumatism was the assignable cause in two cases only. The youngest patient was eighteen years of age, and the oldest fifty-one years of age. These exostoses spring from the periosteum. They are generally of the same anatomical structure as those of the frontal and ethmoidal sinuses, consisting of an ivory-like shell with a nucleus of spongy bone. These external exostoses grow much more slowly than the osteomata of the frontal and ethmoidal sinuses, nor do they attain to the same enormous dimensions as do the latter.

The external exostoses of the orbit are generally found at the *upper border of the orbit*, although they may occur at any portion of the orbital border, so that it is not always possible to distinguish between these exostoses and those springing from the frontal and ethmoidal sinuses before the operation.

Antrum of Highmore.—The osteomata in this region spring, as we have seen, from the medial wall of the cavity, and show a tendency to grow laterally. The tumour, therefore, first shows itself, as a rule, behind the lower eyelid, and the eyeball is displaced first upward, then forward and outward. The osteomata in this region break through the thin floor of the orbit, and project into the nasal cavity sooner than the osteomata of the frontal or ethmoidal sinuses; so that the nasal passages are disturbed early in the disease. Perforation into the cranial cavity is rare: it is recorded only once, in a case in which the tumour had grown to an enormous size. They are rarely bilateral.

Sphenoidal Sinuses.—Osteomata in this region affect the sight, by compression of the optic nerve in the canalis opticus, earlier than the osteomata of the other cavities alluded to. Osseous growths in this region show a disposition to intrude into the cranial cavity at an early stage of the disease.

It has been held that the persistent dropping of fluid (cerebro-spinal fluid) from the nostril, associated with atrophy of the optic nerves, and other brain-symptoms observed by Priestley Smith, Baxter, Nettleship, Leber, and others, had an intimate connection with polypoid excrescences and the associated inflammatory affection of the ethmoidal and sphenoidal sinuses. Leber, as is well known, refers these symptoms to hydrocephalus internus, which, in complete ossification of the skull, would give rise to symptoms of brain-pressure.

This circumstance is incidentally referred to here because, since the anatomical investigations of Axel Key and Retzius, the presence of one of these symptoms—dropping of cerebro-spinal fluid—in osteoma of the ethmoidal and sphenoidal, or even frontal, sinuses would have a practical and important bearing on the prognosis of the case. Axel Key and Retzius found that the nervi olfactorii are surrounded by lymph-sheaths which communicate with the subdural spaces, and empty freely on the surface of the mucous membrane of the nose—that the

subdural and subarachnoidal fluid of the brain may run off by the lymph-channels of the nose. Therefore, the escape of cerebro-spinal fluid (as demonstrated by chemical analysis by Robin and Mehu), in the case recorded by Tillaux, after evulsion of nasal polypi, would be accounted for by assuming an injury to the lamina cribrosa, but which, like those cases of trauma (in which this symptom was present) recorded by Sir James Paget and Bidloo, was not associated with disease of the optic nerve and those symptoms of cerebral pressure, anosmia, motor weakness, and convulsions, which Leber has explained to be due to hydrocephalus internus, giving rise, by pressure, to a small dehiscence in the wall of the ethmoidal or sphenoidal sinuses, and thus to the escape of cerebro-spinal fluid. So long as the tumour is within the limits of the sphenoidal sinus, there may be no subjective symptoms. As the growth increases in size, it enlarges the sinus, and occasions atrophy of its walls, and compresses the optic nerve and the neighbouring parts. One or both optic nerves may be affected, and amaurosis result. When the tumour breaks through the walls of the sphenoidal sinus, it extends into the nasal fossa, ethmoidal sinus, and into the orbit, or cranial cavity; and the latter may take place without giving rise to any subjective symptoms. In a later stage, epileptiform seizures may take place. Death generally results from meningitis or brain-abscess.

Diagnosis.—The condition with which osteoma of the frontal and ethmoidal sinuses is most likely to be confounded is a sarcoma with bony spicula, or a collection of fluid in these cavities, in consequence of which the sinuses become distended and give rise to a prominence at the place in the orbit at which osteomata of the sinuses in question first show themselves. These retention tumours are not stone-hard like the encapsuled osteomata, but yield to pressure. It is, however, not always possible to make the distinction before exposing the growth by an operation. The drill is of value in making the differential diagnosis in such cases. But when we have inflammatory conditions as complications of the osteoma, it is not possible to make a distinction. It is, however, of great practical importance to distinguish between the exostoses originating within the orbit and the osteomata of the frontal and ethmoidal sinuses. The exostoses of the orbit, as we have said, may

occur at any part of the orbital border, but they have been observed most frequently at the upper margin of the orbit, and they grow much more slowly than the osteomata in either the frontal or ethmoidal cavities. But, after all, a positive diagnosis is only generally made at the operation.

Multiple hyperostoses and diffuse bony prominences occur in the orbit, which are distributed over a considerable extent of the bone, in connection with some of which constitutional syphilis plays a significant part.

Prognosis.—Spontaneous exfoliation of osteomata of the *ethmoidal sinuses* has been observed in several cases, and the resultant deformity has been frightful. This spontaneous exfoliation has been the result of trauma in most of the cases recorded. Spontaneous exfoliation of osteomata of the frontal sinuses has also been observed in four cases; but this is rare, and the danger to life is far greater in osteomata of the frontal sinuses than in those of the ethmoidal sinuses, on account of the proximity of the latter to the brain, and their tendency to perforate the walls of the sinus and extend into the cranial cavity. We can only hope to successfully remove these osteomata by surgical operation. Berger and Tyrmann show that of nine cases collected by them of osteomata of the frontal sinus, which projected into the ethmoidal cells, and in which an operation for their removal was pertormed, six ($66\frac{2}{3}$ per cent.) died from meningitis. When an osteoma of the frontal sinus has invaded the ethmoidal sinuses, it has, probably, also perforated the cranial cavity. The operations which I have seen performed on the cranium by general surgeons have convinced me that the prognosis need not be so unfavourable in the latter class of cases, when the operation is performed with care and under antiseptic precautions.

Sphenoidal Sinus.—Osteomata in this region generally first extend into the cranial cavity. No case of successful removal of an osteoma from this sinus has been recorded.

Antrum Highmori.—The prognosis after removal of osteomata from this cavity is good, the operative removal having been favourable in nearly all of the cases recorded.

Berlin states that thirty-eight per cent. of the cases collected by him of osteoma of the orbit which had been operated upon were atal. This statement applied to osteomata of the orbit

in general; but I believe that we should distinguish in such statistics between the regions involved by the osteoma. For instance, Bornhaupt collected 11 operated cases of osteomata of the frontal sinus, of which number 7 died of meningitis (sixty-three per cent.), 2 recovered, and of two cases the result was unknown.

But the majority of the cases from which these statistics were collected were examples of osteomata which had grown to large dimensions, and had already produced great destruction of the walls of the cavities into which they intruded—in some instances projecting into the cranial cavity—and, as in Tweedy's case, giving rise to degenerative changes in the brain itself. It is unfair to make such cases represent the actual danger of orbital osteomata.

Treatment. In osteomata of the frontal and ethmoidal sinuses, &c., we have to deal with a disease which offers the best chances for successful removal when the operation is undertaken at an early period of its existence, before a diseased condition of the tissues (especially suppurative) surrounding the growth has set in; and the latter condition must always constitute an element of great danger in connection with the operation.

There is another reason for operating just so soon as a diagnosis can be made, especially in the case of osteoma of the frontal sinus, *i.e.*, no matter how small the orbital portion of the tumour may be, it is impossible by the orbital portion alone to judge of the real size and extent of an exostosis springing from the frontal sinus. This fact is strikingly shown by Tweedy's case ("Oph. Hosp. Reports," 1882, Vol. X., p. 303). The orbital portion of the tumour may be the size of a pea, and yet the entire sinus be filled with the body of the growth.

In our efforts to remove an osteoma from the frontal sinus, it is, probably, *always better to break down the wall of the cavity through which it has made its passage into the orbit than to make an attempt to remove the growth from the cavity by attacking the body of the growth itself*, since the latter is so hard that a chisel can be forced into it only by employing unnecessary and harmful violence. It is always reprehensible to attempt the removal

of an osteoma by attacking it at its apex. The mallet and chisel are, I believe, the best instruments to employ in the removal of these growths.

In every instance the operation should be performed under antiseptic precautions, and after the removal of the osteoma the sinus should be thoroughly searched for polypi which may spring from the lining membrane of the cavity; when found they should be carefully removed, and the cavity washed with an antiseptic fluid and the wound covered with an antiseptic dressing.

BOUCHARD AND CHARRIN. Cataract produced by Napthaline. *Revue générale d'Ophthal., VI., p. 1, and Klin. Monatsbl., June, 1887, p. 245.*

H. DOR (Lyons). Cataract produced by Naphthaline. *Progrès Medicale and Centralbl. f. Prakt. Augenheilk., May, 1887, p. 145.*

PANAS (Paris). Experiments upon the Nutrition of the Eye with Fluorescine and Naphthaline. *Archives d'Ophthal., March, April, 1887, p. 97.*

In June, 1886, M. Bouchard communicated to the French Academy of Medicine the interesting fact that he had produced cataract in two rabbits by administering to them daily doses of naphthaline, in the proportion of one gramme per kilogramme of the animals' weight. In pursuance of this observation, further experiments were shortly afterwards undertaken by Bouchard and Charrin, by Dor, and by Panas, and the results obtained were again communicated to the Academy of Medicine. The subject has also been taken up by Hess and Magnus (*vide* Centralbl. f. Prakt. Augenheilk., October, 1887, pp. 295 and 300). The observations are worthy of note not merely from their intrinsic interest, but because they have led one experimenter, M. Panas, to a surprising inference concerning the normal nutrition of the crystalline lens.

Dor's experiments gave the following results. Before opacity of the lens appeared, numerous whitish spots were formed in the retina, which proved under the microscope to be aggregations of white blood-corpuscles, in a few instances containing crystals. Similar groups of round cells were found in the choroid, and in almost all the viscera. Exudations were found in the serous

cavities, and here and there abscesses in the muscles. When the administration of naphthaline was stopped in time, recovery took place without changes in the lens. If it was continued, lental opacities appeared, first perinuclear, then total. Dor suggests that the naphthaline produces a blood change, and that the cataract is analogous to that occurring in diabetes and phosphaturia ; he points out the probable danger of over doses of naphthaline in the human subject.

Panas, before recording his experiments and conclusions with regard to naphthaline-cataract, gives an account of a series of experiments conducted by himself and M. Vassaux concerning the nutrient streams of the eye. The method chiefly employed was the injection of fluorescine beneath the skin, or into the posterior auricular vein of rabbits. The results need not be repeated here in detail ; they agree, as the author states, pretty closely with those previously obtained by Ehrlich, Stilling, and others (*vide* O. R., Vol. I., pp. 248 and 413 ; Vol. III., p. 89). From the paths taken by the coloured fluid in the eye during life, and from the staining of the various tissues discovered on dissection, Panas concludes :—(1) That the aqueous humour is secreted in the posterior chamber (espace rétro-iridien), the space bounded behind by the crystalline lens and zonule, laterally and in front by the ciliary processes and iris. Whether the fluid emanates chiefly from the processes or from the posterior surface of the iris remains, he thinks, an open question. (2) That the exosmotic current from the vitreous flows from behind, forwards through the zonule into the aqueous chamber, and not in an opposite direction towards the optic papilla.

The relative importance of the iris and the ciliary processes in this respect is, we venture to think, not so uncertain as M. Panas holds it to be. Apart from the evidence given by other injection experiments, we have the fact that in the processes, much more than in the iris, the secreting surface is expanded by convolution in a manner eminently fitted for secretory purposes. More important still, we have the fact that the iris may be in part or altogether absent, and yet the normal tension of the eye be retained ; while atrophy of the processes appears invariably to be associated with diminished secretion, and degeneration of the lens and vitreous.

In the second place, Panas discusses the several nutritive or lymphatic spaces through which the nutrient fluids pass to and from the tissues of the eye ; he enumerates the following :—

The anterior chamber, with the chief excretory channel, the canal of Schlemm ; the posterior chamber, in which the aqueous humour is secreted.

The cavity between the two primitive layers of the retina—in the embryo an actual serous cavity communicating with the cerebral ventricles, in the developed eye a virtual cavity. This he calls the ventricular space of the retina. The visual purple is secreted here.

The cavity, also virtual in the developed eye, which separates the retina from the vitreous, extending by the hyaloid canal as far as the posterior pole of the lens, and connecting the latter anatomically and physiologically with the parenchyma of the optic nerve—the retino-hyaloid space.

Finally, the supra-choroidal space connected on the one hand with the arachnoid or sub-vaginal space of the optic nerve, and on the other with the space internal to Tenon's capsule.

Having considered these anatomical points, Panas proceeds to record his experiments with naphthaline. Crystalised naphthaline was powdered and made into a paste with glycerine, and of this a 3-gramme dose was given by the mouth daily to each rabbit. Signs of malnutrition of the whole body rapidly appeared, together with excretion by the urine of crystals of carbonate and sulphate of lime. A little later, and before the appearance of cataract, sparkling points appeared in the vitreous, and soon afterwards a number of strongly reflecting spots and plaques in the retina. Microscopic and chemical examination showed these glistening objects to be octahedric and acicular crystals of oxalate and sulphate of lime, and spheroidal masses of carbonate of lime. During the period when these deposits were forming in the vitreous and on the retina, a change of refraction was noted: an irregular astigmatism, due, apparently, to changes in the crystalline lens, which, though still transparent, had suffered some alteration in its intimate constitution. While the retinal changes were increasing the papilla became œdematous and swollen. Later

than the changes in the retina and vitreous, opacities appeared in the crystalline lens—at first, fine radiating striæ between nucleus and cortex, more marked in the posterior layer than in the anterior, and passing on rapidly to opacity of the entire lens, which remained soft and enlarged, and became discoloured of a yellowish or brownish tint. The cataract appeared to be always secondary in point of time to the deep-seated deposits, and to remain absent when the retina remained intact.

These ophthalmoscopic observations were followed by careful dissection, at different stages, of the eyes affected.

The retina showed first localised points or patches of œdema, associated with a slight detachment of the hyaloid and an exudation between the two. Then serous infiltration of the retina itself, and separation from the hexagonal epithelium, and the presence in its layers of sulphate of lime. Later, the hyaloid became completely detached from the retina, the two being separated by an albuminous fluid. Later still, the completely detached retina, freely infiltrated with calcareous granules, became disorganised, and the choroid atrophied, presenting the appearance of a destructive choroido-retinitis.

The papilla showed œdema, and then inflammatory proliferation, with a free passage of leucocytes into the vitreous. The lens showed—first, an accumulation of transparent fluid at the posterior pole, and the formation of vacuoles separating the fibres of the peri-nuclear zone; at a later stage the fluid appeared to penetrate into the nucleus itself, the fibres being disorganised, the capsular epithelium disturbed, the entire lens swollen, its anterior portion stained with iris pigment; finally, crystals of sulphate of lime were to be found in its substance, and, in some cases, the posterior capsule was ruptured.

The vitreous becomes detached from the retina—first, at the posterior pole. Crystals of sulphate of lime surrounded by leucocytes were found in its external layers; these increase in quantity, and the whole vitreous becomes more fluid, especially at its centre.

The aqueous humour contains albumen from the first appearance of the cataract, and the albumen increases in

quantity with the increasing opacity of the lens. Precipitated albumen was found in the aqueous chambers.

The iris remains normal in spite of the deep-seated changes, and the ciliary processes are hardly altered.

From the foregoing observations, M. Panas draws the remarkable conclusion to which we have already alluded, viz., that the nutrient supply of the crystalline lens is derived from the optic nerve and retina, and that the aqueous humour is concerned only in its "disassimilation." Under the influence of naphthaline a "disorganising pathological current" emanates, so he says, from the optic nerve and retina, and passing forward through the vitreous, ultimately disorganises the lens. It is this current which provokes the accumulation between the vitreous and retina, and between the retina and choroid, and leads to a total detachment of these structures. Senile cataract, he thinks, will one day find its explanation in a disturbance of the "optico-vitreous current." In support of this idea he points to a frequent pallor of the papilla in cases of senile cataract, and to the fact that detachment of the retina is often followed by degeneration of the lens.

M. Panas's observations, though admirable, do not necessitate the acceptance of his inference. There is extremely strong evidence, anatomical, clinical, and experimental, to show that the lens and vitreous derive their nutrient supply from the uveal tract, especially from that portion of it which stands in unimpeded relation with these structures, *viz.*, the ciliary portion. Clinical evidence alone will suffice, we think, to prove that the lens does not depend for its nutrition on the vessels of the optic nerve or retina. The central artery certainly does not nourish the lens, for embolism of this vessel, though it absolutely annihilates the function of the retina, does not lead to cataract. The capillary circulation of the nerve is equally unconcerned in its nutrition, for complete atrophy of the nerve trunks may co-exist with transparent lenses for half a life-time. If it were necessary to show that the lymph-stream which traverses the sheath of the nerve (Deutschmann, *vide* O. R., Vol. VI., p. 107) is not a nutrient supply for the lens, we might point to the non-effect of neuritis with hydrops of the sheath. We must then abandon the optic nerve and the central artery

of the retina as possible sources of the secretion which nourishes the lens. What of the hexagonal epithelium and the choroidal capillaries which nourish it? The chief function of these capillaries is certainly connected with the formation of the visual purple and the activity of the rods and cones, and although in morbid states secretions and cellular products from the choroid do find their way through the retina into the vitreous, it is unlikely that the normal nutrition of the vitreous and lens is carried on through a membrane so complex as the retina, which has a separate and isolated circulation of its own. Direct evidence that the ciliary portion of the uveal tract secretes freely into the vitreous, with which it is in direct anatomical relation, and that it nourishes the lens, is not wanting. Subcutaneous injections of fluorescine, notably those of Schoeler and Uhthoff (*vide* O. R., Vol. I., pp. 414 and 415) have revealed a free secretion from the ciliary processes into the vitreous and into the lens. The secretion was most marked at the anterior part of the processes opposite to the lens margin, and was not discoverable further back than the posterior limit of the processes. Neither the choroid nor the optic nerve and its sheaths were ever found coloured in these fluorescine experiments. This appears to prove that secretion is much more rapid in the ciliary portion of the uveal tract than in other parts of the eye, a difference which might reasonably be inferred *a priori* from the structure of the parts.

Although we urge these considerations in opposition to M. Panas's hypothesis, we do not overlook the fact that morbid changes in the vitreous are frequently associated with degeneration of the lens, especially with that form which begins at the posterior pole; we merely maintain that this association is no proof that the lens is normally nourished by fluid secreted in the posterior segment of the eye.

With regard to the particular order in which the several parts of the eye become affected during naphthaline poisoning, it must be noted that later experimenters, Hess and Magnus, do not agree with Panas that the lental changes are always later than those in the retina and vitreous. But, even supposing that this were so, it would be no proof that the lental is dependent on the retinal disturbance.

F. STOCKER (Lucerne). **On the Influence of Mydriatics and Myotics on the Intra-ocular Pressure under Physiological Conditions.** *Archiv. f. Ophth., XXXIII., 1; Centralbl. f. prakt. Augenheilk., July, 1887, p. 211.*

The author records the results of a series of experiments with the manometer, in which by certain special precautions he was able to eliminate sources of error met with by previous experimenters. The modifications of the manometer, the object of which was to render impossible the entrance of air bubbles, and to avoid pressure-changes arising from the elasticity of the tubes, need not be described here. The animals employed were curarised cats, and to the use of this drug the author attaches much importance. since, without it, pressure-changes in the eye are very apt to occur though reflex muscular action, even though anæsthetics be used; to the want of it he ascribes certain discrepancies between his own results and those of other experimenters. Moreover, he always experimented on both eyes simultaneously, the one affording a standard of comparison, while the other was brought under the influence of atropine, eserine, &c. After the introduction of the canulas, he always waited until any temporary oscillations of pressure produced thereby had subsided, and the pressure had become stationary, with the exception of pulse and respiration changes, the presence of which are indispensable as an indication of conditions proper for experiment.

The Normal Intra-ocular Pressure (Curare) varied from 25 to 32 mm. hg., being higher in vigorous than in feeble animals.

Atropine, applied to the conjunctiva in 1 per cent. solution, produced in all cases a gradual fall of the intra-ocular pressure; the fall was in one case as much as 10 mm. hg., in another 6 mm. The lowest pressure coincided with the maximum dilatation of the pupil.

Cocaine, in 4 per cent. solution, reduced the intra-ocular pressure by 2 mm. or 3 mm. hg. In some cases a slight rise of pressure preceded the fall.

Eserine, in 1 per cent. solution, caused first a rise of pressure; then a fall of pressure greater than the previous rise.

The pressure reached its highest point before the commencement of myosis. In the typical case given in detail the initial pressure was 28 mm ; the primary rise was 3 mm., which at the end of twenty minutes passed away ; at the end of another twenty minutes the pressure had fallen to 22 mm., while the fellow eye had fallen to 26 mm.

Pilocarpine, in 2 per cent. solution, produced first general symptoms due to systemic absorbtion, viz., salivation in five to ten minutes, and during about forty minutes considerable oscillations of the intra-ocular pressure in both eyes due to systemic excitement. When these had subsided, the pressure fell in the pilocarpine eye to 4 mm. below that in the fellow eye.

The Action of the Pupil stands, according to the foregoing results, in no fixed causal relationship to the changes of pressure within the eye, for the pressure was seen to fall both during increasing mydriasis and during myosis.

In addition to the foregoing, Stocker made some observations with the ophthalmometer concerning the corneal curve under the influence of these several drugs. Atropine and cocaine produced no change in the curvature of the cornea beyond such as might be due to errors of observation. Eserine and pilocarpine produced a diminution in the radius of the cornea ; thus in one case the initial radius was 7·416 mm ; twenty-five minutes after the use of eserine it was 7·27 mm.

BELLARMINOFF (St. Petersberg). **The Graphic Method in the Study of the Intra-ocular Pressure.** *Archiv. f. d. Ges. Phys., Vol. XXXIX ;* abstracted in *Centralbl. f. Prakt. Augenheilk., February*, 1887, *p.* 54.

By means of an ingenious application of Schulten's Manometer, the author has succeeded in registering photographically the intra-ocular pressure changes occurring in the eyes of living animals. Sensitised paper is carried by a revolving drum in a dark box ; the glass tube of the manometer coincides with a narrow slit in the side of the box. This tube, which is of very fine calibre, contains a column of red fluid, broken in one place by an air bubble. Actinic rays of light, being absorbed by the red fluid, can enter the box only through the air bubble, and thus

the position of the bubble is photographed upon the paper, and variations in the pressure of the manometer are graphically represented in the form of a curve as the drum revolves. By means of this apparatus, which, though rather complicated, is said to work very accurately, Bellarminoff obtained the following results :—

The vitreous pressure and the aqueous pressure are equal.

Under normal conditions the curves representing the intra-ocular pressure and the general blood pressure are parallel.

When a change of blood pressure depends upon a cause which alters the tone of the ocular vessels, the curves are not quite parallel; they differ most when the tone of the ocular vessels is altered by a local cause.

Irritation of the sympathetic at the end next to the head causes first a rise, and then a considerable fall, of the intra-ocular pressure.

Irritation of the gasserian ganglion gives various results according to the point of the ganglion to which the needle electrode is applied.

Irritation of the oculo-motor nerve within the skull causes an inconsiderable and transient rise of pressure, which ceases when the irritation ceases—probably a result of contraction of the ciliary muscle (or of the recti.—P. S.)

There is no causal relation between movements of the pupil and changes of the intra-ocular pressure; thus myosis produced by the action of sunlight causes a rise, while myosis produced by eserine causes a fall, of the intraocular pressure. (This seems not quite conclusive; strong sunlight produces retinal and choroidal hyperæmia, and hyperæmia causes rise of tension; it is unsafe to say that the rise produced by bright light is caused by the myosis; it may still be true that the myosis *per se* tends in the opposite direction.—P. S.)

Normal variations of the intra-ocular pressure do not exceed 1 to 2 mm.; compression of the trachea causes greater variations.

Normal pulsation changes do not exceed ½ to 2 mm., but during increased cardiac action, or during action of the ocular muscles, they may be 2 to 3 mm.; and when the intra-ocular pressure is increased they may be greater still.

OPHTHALMOLOGICAL SOCIETY OF THE UNITED KINGDOM.

THURSDAY, DECEMBER 8TH, 1887.

J. W. HULKE, F.R.S., President, in the Chair.

Reported by JOHN ABERCROMBIE, M.D.

Hæmorrhage and Proptosis after Subjunctival Tenotomy of the External Rectus.—Dr. Emrys-Jones. A little girl aged 10 had both internal recti divided for alternating convergent strabismus. Immediately after division of the left there was profuse hæmorrhage into Tenon's capsule, leading to proptosis. A firm bandage was applied, but two hours later the proptosis was more marked, the pupil was widely dilated, inactive to light, and perception of light very doubtful. The optic disc was very pale. The pressure was maintained, and from this time rapid improvement took place, and recovery was eventually complete.

Persistent Hæmorrhage in the Anterior Chamber after Iridectomy for Chronic Glaucoma.—Dr. Emrys-Jones. The patient was a man aged 63; right eye almost blind, and + 1; left eye, vision $\frac{6}{18}$, and field of vision much contracted. The optic nerve was cupped. Iridectomy was performed on October 24th, 1882. Free hæmorrhage followed, and the next day the anterior chamber was full of blood, and no trace of iris could be detected anywhere. There was scarcely any improvement in a fortnight. One month after operation the hæmorrhage had subsided considerably, and the outline of the pupil could be detected. The improvement was excessively slow, and it was not until December 16th that an ophthalmoscopic examination could be made, when the vitreous was found to be clear and the optic nerve much cupped. There was cardiac disease, and the patient died on January 17th, 1883, from double pneumonia. Mr. Haynes Walton had mentioned this condition in his book when treating of injuries to the eye from mechanical causes.

The President asked what method of subconjunctival tenotomy had been adopted in the first case; he could not

recall any similar occurrence. In the second patient the case was one of persistent hæmorrhage, the blood retaining its colour, as was sometimes seen in diabetic patients.

Mr. Adams Frost and Mr. Ernest Clarke had met with cases exactly like the one recorded in the first paper, the latter speaker suggesting that division of the tendon too near its insertion was perhaps the cause.

The President pointed out that this could hardly be the case, as the object of Graefe's operation was to divide the tendon as close to the globe as possible.

Mr. Lawford had seen one case in which severe hæmorrhage had followed tenotomy, leading to proptosis and duskiness of the lids. The patient, a boy, went on well at first, but subsequently had a relapse after a sudden effort.

Mr. Brailey had seen instances of this accident, in one case leading to atrophy of the optic nerve. He had always been inclined to attribute the occurrence to a too free use of the hook rupturing one of the ciliary arteries, and he considered Graefe's operation very unlikely to lead to such an accident.

On Congenital and Hereditary Defect of Ocular Movements.—Mr. Lawford. Four cases under care at St. Thomas's Hospital; a father and three of his seven children, the remaining four being unaffected. The three children who were the subjects of this congenital defect were numbers 2, 4, and 7. In all four patients were present the following symptoms: almost complete bilateral ptosis, loss of upward and downward movement of the eyeballs, and very defective lateral movement. Visual acuteness and accommodative power were good, and there were no ophthalmoscopic changes. None of the patients presented any other congenital defect, and they were healthy in every other respect. He referred to published records of similar cases, in some of which *post-mortem* examinations had been obtained, and drew attention to the fact that the ocular muscles, and not their nerves, were the structures at fault. These muscles had, in some instances, been absent; in others, though present, they were occasionally ill-developed, and generally shorter than the average measurement, while in almost every case their insertions into the sclerotic were

displaced more or less backwards, the greatest degree of displacement being 2·5 mm.

The President thought it difficult to say whether the muscles were primarily at fault, or whether there was defective innervation; disease in early life might produce such effects.

Mr. Quarry Silcock supported the last idea, and related the case of a boy in whom the eyeball was not noticed to be fixed till the age of 3 years, after a general illness which might have been infantile palsy, with a localisation of the eyeball muscles.

Mr. Power spoke of the solidarity between nerve and muscle; the condition might be looked upon in some cases as a reversion to an earlier type; turtles and other reptiles had little movement, and perhaps some mammals might show an absence of the levator.

Dr. Angel Money objected to the principle of so-called reversion to an earlier type, and preferred to speak of an arrest of development.

Mr. Brailey said that the manner of development of the ocular muscles was not known; he did not think the reversion theory would hold good in the present instance.

Dr. Seymour Sharkey and Mr. Doyne thought that the term reversion was a useful one.

Living and Card Specimens.—Mr. Silcock. A case of exostosis arising from the inner side of the orbit; sight had been early affected and was almost completely lost.

Mr. Hulke thought an exploration should be made; in one case in his own experience the tumour proved easy of removal.

Mr. Henry Power had had considerable difficulty in removing an exostosis from the roof of the orbit.

Mr. Silcock, in reply to Mr. Nettleship, said the sight failed after the proptosis had been present one year.

Mr. Spencer Watson considered exploration would be necessary; but caution should be used not to employ too much force in chiselling, &c.

Mr. Gunn: A peculiar foveal reflex in connection with amblyopia and myopia.

Mr. Nettleship showed an ophthalmoscopic drawing from a case of night blindness, with white dots scattered over the fundus. A discussion followed relative to whether these spots were identical with those seen in Tay's choroiditis.

THE BOWMAN LECTURE ON "THE RELATION OF OPHTHALMIC DISEASE TO CERTAIN NORMAL AND PATHOLOGICAL CONDITIONS OF THE SEXUAL ORGANS."

By Henry Power, M.B. Lond., F.R.C.S.

The subject chosen presents, as the lecturer remarked at the outset, many points of interest, and has received but little attention in modern text books. After stating that, before the age of puberty, the sexual system is without influence on the affections of the eyes, in either males or females, the lecturer primarily divided his subject into two classes, and proceeded to consider the relations the generative system bears to diseases of the eyes in each sex separately. Beginning with the male sex, the effect of the practice of masturbation was first noticed. The eye symptoms recorded by authors, as referable to this degrading habit, have been usually of a functional character, such as photopsiæ, muscæ, and muscular asthenopia. Förster and Cohn consider that a connection exists between persistent conjunctival inflammation and masturbation. Blepharo-spasm has also been attributed to this cause. Mr. Power gave it as his opinion that the effects of onanism upon the visual organs have been on the whole exaggerated.

Disorders of vision in men, consequent upon sexual excesses, are generally amblyopia, muscæ, and failure of accommodative power, but in some instances serious affection of the optic nerves ensues; a case under the care of the lecturer was mentioned, in which great pallor of optic discs, with much impairment of vision, resulted from such excess. Perfect recovery of sight occurred when the cause was removed, though the discs remained pale.

In the female sex the onset of puberty is accompanied by changes in the whole economy so much greater and more complex than in the male, that the influence of the sexual system upon the eye is much more potent. When the institution of the menstrual flow is interfered with by any circumstance, it is not surprising that the eyes should, in common with other organs, be the subject of symptoms, often justly attributable to the uterine disorder. In such cases,

hæmorrhage from the choroid not infrequently occurs; the effusion (sometimes of the nature of lymph, at others pure blood) is poured into the vitreous, and vision is seriously impaired. M. Dor reports one case of a girl with amenorrhœa, in whom hæmorrhage into the vitreous took place at intervals; when menstruation was regularly established, this entirely ceased.

Various forms of keratitis are seen in females suffering from amenorrhœa and dysmenorrhœa, and a tabular statement of all cases of keratitis, in both sexes, compiled from the books of St. Bartholomew's Hospital Eye Department was shown, and several deductions were made from the statistics thus obtained. Of these, the following three may be quoted:—(1.)—That there are many more cases of keratitis in females than in males (205 to 138). (2.)—That in the second decade, that of commencing menstruation (11 to 20), this difference is more marked. (3.)—That during the menstrual period of life (20 to 40) there is a fall in the percentage of cases in females, and that at the age of the climacteric there is a remarkable diminution, the percentage among males being then higher.

Serous irits, as a concomitant of amenorrhœa and dysmenorrhœa, has been observed by many writers.

Retinal hæmorrhage consequent on sudden suppression of the menses, has been frequently noted, and some well recorded cases were mentioned. Retinitis and optic neuritis occurring in women in whom arrest of the menstrual flow followed exposure to cold, mental shock, &c., is also well known. These cases have usually ended in partial or complete recovery. Paresis of ocular muscles, both external and internal, has been observed in connection with catamenial irregularity, and a case recorded by Hasner, was quoted, in which complete paralysis of one third nerve occurred with every menstruation during a period of four years.

Mr. Power holds that "menstrual disorders constitute a factor in the development of the obscure affection termed conical cornea." Amaurosis and other functional disturbances of vision are often met with in association with amenorrhœa and dysmenorrhœa; after narrating one such case, the lecturer said: "The precise mode in which disturbance of the

menstrual function operates in inducing ophthalmic disease is obscure. It may be by retaining in the blood, in cases of sudden suppression of the menses, and in cases of amenorrhœa more slowly induced, materials that are of a poisonous nature, the action of which is indicated by the loss of blood-making power, and consequent imperfect performance of other functions, with spasms and pain in different regions of the body, in which the eye participates; or it may be by acting on the vessels of the eye alone through the nervous system in a reflex manner, and thus interfering with its due nutrition, as we know may occur in cases of dental disease and the intestinal irritation of worms."

In pregnant women, failure of accommodation is a very frequent symptom, and is usually met with in the later months of gestation. Malnutrition of the ciliary muscle due to the watery condition of the blood, may be the cause.

Retinal hæmorrhages sometimes result from the strain of the severe vomiting of pregnancy. In the early months of gestation, cases are now and then observed, in which there is sudden impairment of vision, without ophthalmoscopic changes. A well-marked instance was mentioned by the lecturer of a lady, æt. 28, under his own care, who in the third month suddenly lost the lower part of the field of vision in the right eye. Though the symptoms pointed to embolism, no ophthalmoscopic evidence of such could be obtained. No improvement occurred, and eventually there was partial atrophy of the disc.

"Gravidic retinitis, a condition that very closely resembles, and is, perhaps, identical with, albuminuric retinitis," was treated at some length by the lecturer; and subsequently the ophthalmic symptoms that may be met with in the puerperal state were briefly referred to, such are embolism of the retinal arteries, "septic puerperal embolism" described by Hirschberg, in which suppurative panophthalmitis occurs, and pareses, and paralyses of the ocular muscles. In the suckling woman, failure of the ciliary muscles, keratitis, and hypopyon keratitis from very slight injuries, are frequently met, and are probably indications of the general exhaustion resulting from prolonged lactation.

A few words on the "powerful influence which the critical age of the menopause in women exerts upon the development of glaucoma," followed by a short resumé of the chief points discussed by the lecturer, brought this interesting address to a close.

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